# JOURNAL

ROYAL ARCHITECTURAL INSTITUTE OF CANADA

OL.25
RONTO
PTEMBER
1948
No.9

# J O U R N A L

## ROYAL ARCHITECTURAL INSTITUTE OF CANADA

Serial No. 277 TORONTO, SEPTEMBER, 1948 Vol. 25, No. 9

PRESIDENT . . . . . A. J. HAZELGROVE (F)

# C O N T E N T S



THE INSTITUTE DOES NOT HOLD ITSELF RESPONSIBLE FOR THE OPINIONS EXPRESSED BY CONTRIBUTORS



Editorial and Advertising Offices - - - - - - - 57 Queen Street West, Toronto 1

SUBSCRIPTION RATES

Canada and Newfoundland—Three Dollars per year. Great Britain, British Possessions, United States and Mexico—Five Dollars per year. All Other Countries—Six Dollars per year. Single Copies—Canada 50 Cents; Other Countries 75 Cents.

JOURNAL
R. A. I. C.
SEPTEMBER 1948

OF all the building problems of government, and, today, they are many and varied, none is so acute as the hospital. It is acute because hospitals are urgently needed, and because, in no other type of building are the effects of soaring costs so evident. In many ways the problem resembles the school. In both, the architect is baffled in drastically reducing costs to anything like a prewar level because, parallel with rising prices, is a public and professional demand for increased educational or medical services. These, rather than bricks and mortar are the reasons for the capital costs in hospital construction that one hears of today.

NOT that the bricks and mortar are negligible. Obsolete codes or in the absence of codes, obsolete practices, often require ceilings of 11′-0″ where modern practice in the United States shows 9′-0″ as satisfactory or better. The two bed ward can be analysed for minimum dimensions and furniture in the same way as a classroom, and a study may indicate surprising savings without loss, and indeed with gain, in services. However important such studies may be in savings effected, they are small compared with savings which can be made within the framework of a provincial or state plan.

WE have outlived the period when municipal taxation or private philanthropy, or both, could handle the building of hospitals. Taxation has, to a large extent, set limits on private philanthropy that were unknown in the 19th century, or even in the 20th, twenty years ago. The old system produced hospitals, but it did so without relation to the needs of the economic and geographic area in which the hospital was situated, and, too often, without regard to the needs of its immediate locality. So, we find a hospital with two operating rooms, one of which was never used, and a hospital with an elaborate laboratory to which trained technicians could never be attracted. Lay or professional enthusiasm was a poor substitute for planning on a regional scale. Planning, at the provincial level only, can solve the problems of the hospital, and show, by irrefutable plans and figures, where a hospital should be, and the accommodation it should have. The provinces are in the hospital business in a large way, and only by planning can they protect their investment, and safeguard the health of citizens within their boundaries.

OUR acute hospitals are all crowded, a condition which has been brought about by the depression and the war, when little building was done, and by hospital services like the Blue Cross. There are other factors, but those are probably the most important. Research shows that not all the patients in the acute hospital are acute patients whose stay would not average more than ten days. Many are chronic patients each of whom annually occupies a bed which thirty-six persons could have used. One hundred chronics in acute hospitals occupy beds that thirty-six hundred persons could use in a year; and Dr. Vivian estimates that 20-25 per cent of patients in acute hospitals are chronic cases. One of our great needs is therefore for chronic hospitals. This would be a simple matter if chronics could be put in old derelict Victorian houses. They can, of course, and are, but the fire hazard and nursing difficulties can be imagined. Worse, to our mind, is the assumption that the sufferings of arthritic patients cannot be alleviated by therapy, or that the diseases of old age are not worth studying. In the best chronic hospitals in Canada, various therapies are carried on, but research is practically non-existent. It is not so in the better chronic hospitals in the United States, where one gets the impression from resident medical staff, internes and research workers that the diseases of old age are, in every way, as interesting and important as tuberculosis, polio or the common cold.

IT will easily be seen that according to American standards the Chronic Hospital is in no way cheaper to build than the acute hospital. It is merely ignoring the problem to put the chronics in a private dwelling. Using the strictest economies, perhaps the cheapest hospital is the convalescent, but where they should be built and of what size can only be determined by a survey or general plan. Every state in the United States has such a plan or is in the process of preparing one. We would like to think that, within the next five years, the same may be said of the provinces of Canada.

# PANEL DISCUSSION ON HOSPITAL BUILDING

By THE HON. PERCY VIVIAN, M.D.

**An Address at the Fifty-Eighth Annual Meeting of the Ontario Association of Architects**

I MUST thank Mr. Arthur for that very kind introduction, but I certainly feel that he has over-sold his product. I am really very honoured to be here with you this afternoon, to take part in this discussion on hospital buildings, but I also feel very much out of place. I know relatively nothing about architecture or of the various skills required in actual construction. The only thing which I may be able to do is to present briefly, and I hope, fairly completely, those problems which exist with regard to hospitals in the Province of Ontario, and that determine the type of hospital facility and service which we have.

At the present time there are one hundred and twenty public general hospitals scattered all over the Province, and they are easily divisible into certain groups. Eight of them are so-called teaching hospitals, located in the three centres of London, Toronto and Kingston, and used by the Medical Schools of the respective universities. There are six other public general hospitals in the cities in which these medical schools are located, but which take no part in the teaching. We have, in addition, some thirty-two hospitals having a capacity of over one hundred beds, and seventy-four hospitals possessing fewer than one hundred beds. I might say that the bed range runs from a low figure of twelve to a figure close to twelve hundred bed capacity. Most of these hospitals are relatively old. One looks at the order of their establishment and finds that prior to 1884 we had twelve hospitals in Ontario; from 1884 to 1900 thirty-three new ones appeared; from 1900 to 1913 inclusive, thirty-one; from 1914 to 1919, seven; from 1920 to 1929, thirty-six; and since 1930 to 1945 only six. I have purposely grouped them in those chronological periods because of relationship to war, depression and so on.

Now in a few instances improvements have been made in the smaller institutions. In some cases the original establishment of a hospital still has the original name of the hospital but a new building has appeared on the scene. But in large part most of the hospitals that were built in those periods of time are still in existence and are still being used to a greater or lesser extent. In other words, hospital construction up until 1945 has simply made small adjustments in the method of providing facilities for service of the same kind that was undertaken as far back as 1884. These, gentlemen, are the buildings which we have in relation to the hospital care in this Province. Their total bed capacity amounts to fourteen thousand and eighty-one beds, of which six thousand, seven hundred and ninety-two are public ward.

The problems of hospitals might be summarized into three points: first of all, how to meet the increasingly heavy demand for in-patient service, that is, for patients who must be cared for within the hospital; secondly, how the hospitals can meet the rising cost of their service from their present revenue; and thirdly, how they might provide the additional services that are required for the total health needs of the community.

To gain an understanding of these problems, because those three points are the hub of an understanding of anything relating to the hospital, whether it be construction or management, one must know how the hospitals are presently run. Out of that total of one hundred and twenty there are some dozen whose deficits are paid by the municipality in which they are located and they are classed as Municipal Hospitals, the rest operated as voluntary non-profit organizations. The non-profit is very largely a joke, because they never have any anyway. It is always a deficit and that deficit must be met out of voluntary funds. Their sources of revenue are from patients, directly or indirectly, through insurance companies or other agencies responsible for their care, and assisted to some extent by maintenance grants from municipal and provincial governments.

Now these maintenance grants are a source of great difficulty. At the present time the Province of Ontario pays to each hospital an amount of money for the support of the patient in the public ward. This amounts in the case of teaching hospitals up to one dollar; in the hospital with one hundred or more beds, up to seventy-five cents, and in a hospital with less than one hundred beds, up to sixty cents, but the actual amount of this grant is conditioned by the relationship that the public ward beds bear to the total number of beds within the hospital, and by the cost of the actual per day service per patient in that particular hospital. Municipality grants on the other hand are paid in the amount of two dollars and twenty-five cents for each indigent within the hospital by the municipality responsible for that particular person. You can thus see that hospital financing can be an extremely difficult proposition, that hospitals are dependent upon these revenues for operating, minimum maintenance, and also for expansion, unless additional money is forthcoming from voluntary contributors or by grants from municipalities. But there is at the present time a policy of the Government of this Province to pay

a grant of one thousand dollars per bed for approved new construction to assist in the total of the cost, which many of you know is excessively high at the present time.

The need for hospital accommodation is obvious. The difficulties are to be found in these three points which I have laid before you, and they relate largely to the method by which hospitals are run and the services which can be accorded between them. This demand for service is not likely to change very markedly. It has increased in the last few years partly because of an improved economic condition of a substantial number of our population, but it has also improved because there has come into existence protection against the cost of hospital care through hospital insurance plans. And in these the Blue Cross plan takes leading place and there are now in this Province over a million subscribers who get the benefit of this protection. One fourth, and a little better, of the population of this Province is now protected by Blue Cross insurance. If the demand is likely to continue, and a peak load seems to be with us, then it becomes a problem of how that demand can be met. One would say it is obvious that the only way to meet it is to increase the number of beds available for treatment of the disabilities of the general public.

It is an easy way to state it, but with that must go two other factors which will condition the number of beds. First of all is the extension of the service in prevention which would render the figure for new beds less than might be considered to be necessry at the present time. The second factor is the type of hospital bed that one would require to best service the needs of the particular community. We talk in terms of bed capacity, which is, I think misleading, because when we mention beds we must also include with any given number of beds certain ancillary services for diagnosis and for the work dependent on treatment, because modern progress in medicine has demanded new techniques that calls for a lot of support for ancillary services, which are necessarily costly.

Now the amount of this ancillary service will vary, depending upon the size of the hospital, its location, and the type of work that it is doing. As one example, I might say that one of the new hospitals in the very early stages of construction as a teaching hospital in this city, has to provide at least fifty per cent of the total floor space or of the total volume of the building, whichever way you like to put it, for ancillary services. The beds themselves in relation to the total size of the structure may not appear to be large — some five hundred — but the total institution is a vast organization to serve these five hundred beds, plus the attendant duties in the teaching and research field. Now that, perhaps, is a single example and perhaps it may appear to be an exaggeration, but the relationship, whether it be in a modern teaching hospital or in a small community hospital, between ancillary services and actual bed capacity is in direct proportion.

One wonders how to determine the number of beds required for a community. The method which has been in force was a delightful one, and the only comparable type of determining was by suspending a barometer from a sky-hook, because the method used was to guess how many people were ill in a particular community and to estimate that out of the total number, so many of them should go to hospital. That, in terms of population, gave the delightful figure of three beds per thousand as a community requirment. We soon found out that three beds (per thousand population) were totally inadequate and the figure was lifted to five. And when it got to seven, people suddenly realized that the method of computing the need was totally erroneous and might just as well be scrapped. So one can only say of the number of beds required for a community, that there should be enough to cope with the type of community in which the hospital is located and the service which it attempts to render; that on the annual basis of occupancy the beds will carry no more than an average of seventy-five per cent occupancy. Over the period of a year, seventy-five per cent occupancy provides enough leeway between the peaks and the valleys seasonally that the hospital is able not only to provide reasonable accommodation, but it is also able to protect itself against serious loss by continuing overhead in those periods of time when the hospital is not too full of patients.

Another way of estimating the needs of the community is in relation to how best the services can be used, and this is perhaps the most accurate yard stick which we have. As an example, the average duration of stay of a patient in a hospital over a year will determine the number of people (being served) at that hospital. If the annual average duration of stay is fifteen days, a one hundred bed hospital — if my arithmetic is correct — can serve about twenty-five hundred people. If, on the other hand, the average days' stay can be reduced from fifteen to ten, then we are able to serve a great many more people — to the amount of three thousand, six hundred and fifty. So the needs of a community for hospitalization are best based upon the expected average stay in a public general hospital, because that is the most expensive type of hospital care that we can give.

If the average expected stay appears to be lengthy, we must look for the reason for it, and the reason for it is to be found in the number of patients whose chronicity of illness keeps them in hospital for over sixty days, and there are a substantial number of them. As a reasonably accurate guess one could say, from surveys which have been made, that twenty to twenty-five per cent of the beds of the public general hospitals of this province at the moment are filled with cases of chronic illness. That is rather staggering. What can one do about it? Many of these cases require some of the ancillary hospital services at some period of their treatment. Therefore, they cannot be moved from close association with the general hospital, but they are in beds which normally

should be turned over to serve the short-term patients.

Perhaps the simple solution — that which is being used now and which shows the trend — is the building in close association with an active public general hospital of a wing or an addition in which to house the long-term patients. What does that do? The cost of hospitalization is figured at the rate per bed per day, which must carry on it the cost of ancillary services. If you remove the patient from that relatively high cost area of the hospital and place him in a relatively low cost area, the hospital is saving money and so is the patient. When you have to construct these additions one can see what has happened. I have a figure here which I think is impressive. To add an extension to a small existing active public general hospital it cost sixty-eight thousand dollars, plus ten thousand dollars for the necessary furnishings. No additional ancillary services were provided. That figures, for twenty-seven beds, at about twenty-nine hundred dollars per bed, which is perhaps less than half, or even less than a third, of the total cost of construction if it were a new institution with all these necessary ancillary services included.

What do I mean by types of accommodation in relation to the community? I do not mean that they have to be beds in a hospital, or that they have to be beds in a particular type of hospital. We have to consider both. I gave you the figure of the very high percentage of public ward beds to the total bed accommodation in the province. Out of fourteen thousand and eighty-one, some sixty-seven hundred and ninety-two — about a little less than half — are public ward beds. Now with hospital insurance and other insurance plans coming into effect, the great need is for semi-private accommodation. Public ward service in a teaching hospital, or in a large centre, is a staff service rendered to the patient. The patient is obliged to accept the service of the hospital and to be without the service of his own physician unless that physician is also on the staff of that hospital. People with insurance, and therefore entitled to services other than the public ward, are having to take their time in hospital public wards because there is no other accommodation for them. And so, not only the type of hospital is an important factor, but also the type of accommodation within the hospital. In the cost study which was done through the Department of Health from 1943 to 1945, we found that there was less than a dollar fifty cents of difference between the cost of giving service in the public ward and the cost of giving service in private accommodation. The reason for the price of private accommodation is the effort to make up, to some small extent, the loss on the public ward patient, and because in the available accommodations there are too few semi-private and private rooms for those who are able to pay and who want the service.

I might say that one of the interesting methods of dealing with this problem is to be seen in some of the hospitals that you are constructing, particularly in general hospitals, where rooms have been made that are big enough to accommodate two beds for semi-private care, but are not too big to accommodate one bed as a private room. The same thing is true of rooms where two or three can be accommodated. In considering the number of beds in a room or ward the trend is very definitely against those large open spaces that are commonly seen in teaching or other hospitals. The feeling is that the facilities should provide a smaller unit for even the public ward patient, perhaps not exceeding eight or twelve beds.

I want to speak now on the size of the public general hospital. As I told you, these range in size in Ontario from twelve beds to close to twelve hundred and they reflect the community in which they are located. Primarily a hospital was built to serve the local needs, but with the development of teaching instruction, the opening up of easier methods of transportation, specialization and the location of specialists in larger centres, the trend has been from the less populated areas to the more populated areas and eventually to the University centre for treatment of unique or rare conditions. Prior to this time, most small hospitals have attempted to duplicate, almost to the last detail, the facilities present in the large institutions, with the exception of teaching services. This fact makes it difficult for us to realize the amount of money which is wasted because of the very character of the organization of the hospital itself, and where further bed accommodation is needed but is not possible. The trend is very definitely to a co-ordination of hospital services leading from the individual's own community, particularly where it is a small one, through to a larger centre for those additional services which do not need to be provided locally, and then to the University centre or the major medical centre for treatment of those cases which are advanced in nature.

With the public general hospital one must also consider other types. We have in this province some ten hospitals built for the chronic and incurable patient. We have two convalescent hospitals. There are some eight or ten sanitoria for tuberculosis, which have, in fact, become hospitals in many instances, with the addition of surgical services for the modern treatment of poliomyelitis and tuberculosis. We have also some seven or eight hospitals for mental patients throughout the province. These hospitals are all related to the community needs for hospitalization, and up till now there has been no particular thought or pattern developed as to how all these services could be co-ordinated. This is not an easy task, but if one is going to think in terms of building hospitals or extending existing hospitals, to better serve the needs of the community, they must all be taken into consideration. What then, can one do? What should be the pattern for the attack on this problem? In my opinion it must be attacked before anyone can given an adequate opinion on the type of construction, the cost of materials, or the time that it would take to build the type of hospitalization that is now needed in this province. That type is in the under-one-hundred-

bed institution. One must take into account those things in the hospital of under one hundred beds that reflect a service for a fairly large community. If our figures are correct that twenty to twenty-five per cent of patients are in for a long stay or are chronic cases, then each one-hundred-bed hospital should have as an addition twenty-five beds without additional ancillary services for these longer stay patients. This is accommodation which could be given at a lower cost in service and which would cost much less to build.

The second thing one must be prepared to do is to assure the hospital that in this expanding programme funds will be available for capital costs. At the present day, they are unable to attract sufficient money on a voluntary basis to meet the high cost of construcion, or infrequently even the cost of twenty-nine hundred dollars a bed, which I mentioned. There is the provision of this thousand dollars per bed from the Provincial Government and there are grants from Municipal Governments. The adequacy of those grants can best be judged in relation to the cost as a whole and a fair policy determined as to the responsibility of levels of Government with voluntary institutions in helping to solve one of the problems of community health.

The third consideration one must give is to the payment by the patient or the accounting of the patient for the time spent in hospital. Costs per day in hospital in our larger centres now are running six dollars and eighty-eight cents per public ward day. The cost in 1943 on 1942's figure was in the vicinity of four dollars and fifty-six cents. Now this charge is beyond the paying ability of most individuals for any length of time. They are protected by hospital insurance in some measure, and hospital insurance agrees to pay the hospital the going ward rate based on their costs. Therefore the logical extension is to see that the hospital is assured of its costs at the public ward level at least. For those who become indigent because of the extra load through sickness, additional monies should be forthcoming between the Provincial and Municipal Governments to provide a higher level of return for the patient in the public ward who cannot pay in whole or in part for himself.

And the last point, and I think perhaps one of the most important for the future, the trend and the practice of medicine was first of all cure and alleviation of the sick, and historically the development that followed was the prevention or limitation of communicable diseases and then of other illnesses. The trend at the moment is to link medical care and public health services for the improvement of those in the community who appear to be reasonably well and to protect them for as long as possible against the amount of chronicity that is in our midst with our extensively aging population, because our measures in public health for expectant mothers and infants have increased markedly the expectant span of life. We have now in this country and on this continent a greater number of people over thirty, and indeed over forty years of age, than we have ever had before. If we are to provide protection for them from the disabilities which come from stresses and strains, the general arthritic disabilities of middle-age and later life, then an additional type of health protective insurance must be found for this type of individual. That can only be found through early diagnosis, which demands ancillary services which are not of public general hospital support, but in some manner by the services in Departments of Health, which are set up by the people through the Government to satisfy the health needs of the community.

☆ ☆

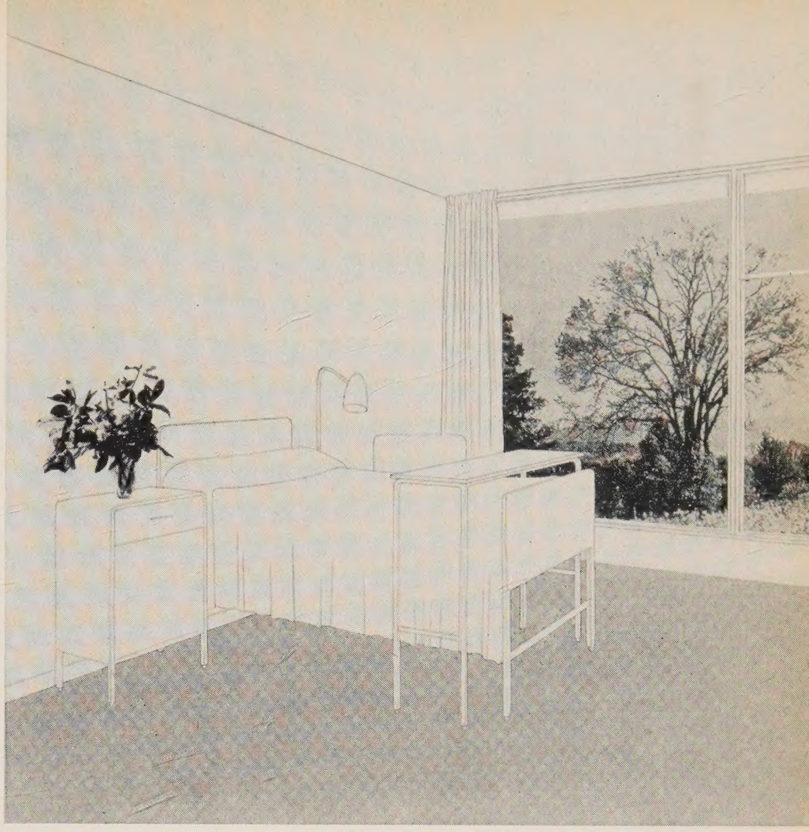
# *Do We or Do We Not*

# ORIENT THE BEDROOM?

By NATHANIEL A. OWINGS

Skidmore, Owings & Merrill

Architects and Engineers, Chicago



Photograph by Williams & Meyer Co.

VOLUMES have been written on orientation—"solar" systems and bedrooms to the south, for instance—so there is no reason to go into a lengthy definition. But here is a short one that covers the subject as we see it: "The design and orientation of the patient's bedroom so as to obtain the maximum 'controlled' use of the sun in order to obtain the maximum therapeutic value to the patient." Specifically, this means generally south for non-ambulatory or semi-ambulatory patients and east or west for ambulatory patients. The only two basic collateral elements that may influence this are prevailing breeze and an outstanding view.

If the principle of orientation is considered primary and mandatory, then an amazing number of other fundamental questions automatically settle themselves. If orientation is ignored or reluctantly abandoned—either through specious reasoning or for what might superficially appear to be valid objections—then none of the basic elements are settled and anything can happen except the right thing.

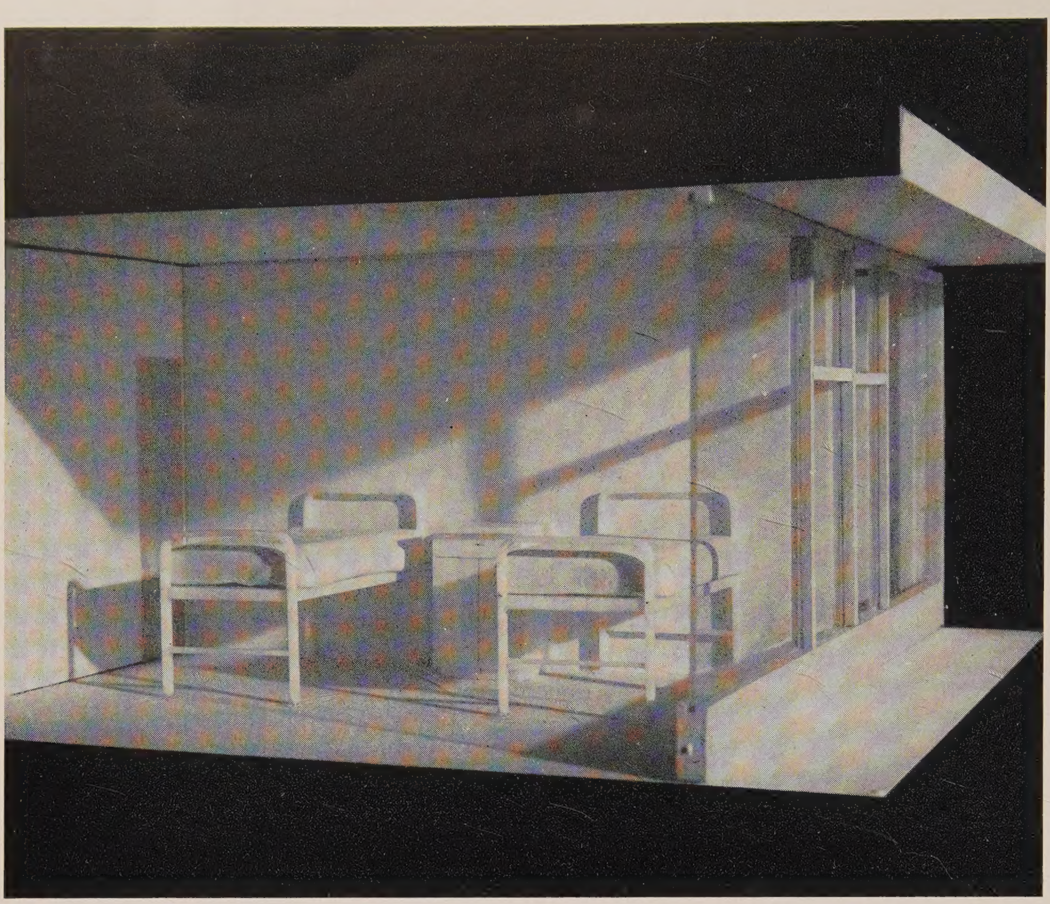
The battle of orientations has been bitter but, in my opinion, is all but won if the architects and hospital consultants want it to be. To me, orientation of a patient's bedroom is the most fundamental element and must be decided upon first if the hospital is to be properly planned.

The second reason for choosing orientation as a subject is because we encountered extreme difficulties in making it stick, in getting it accepted by the client, consultant, and even other architects. We are having some success, but to achieve acceptance we have had to meet towering, forbidding objections. Some of these most persistent objections are cost, glare, distance of travel for nurses, and esthetics. These have been overcome one by one through actual facts, figures, costs and medical authorities.

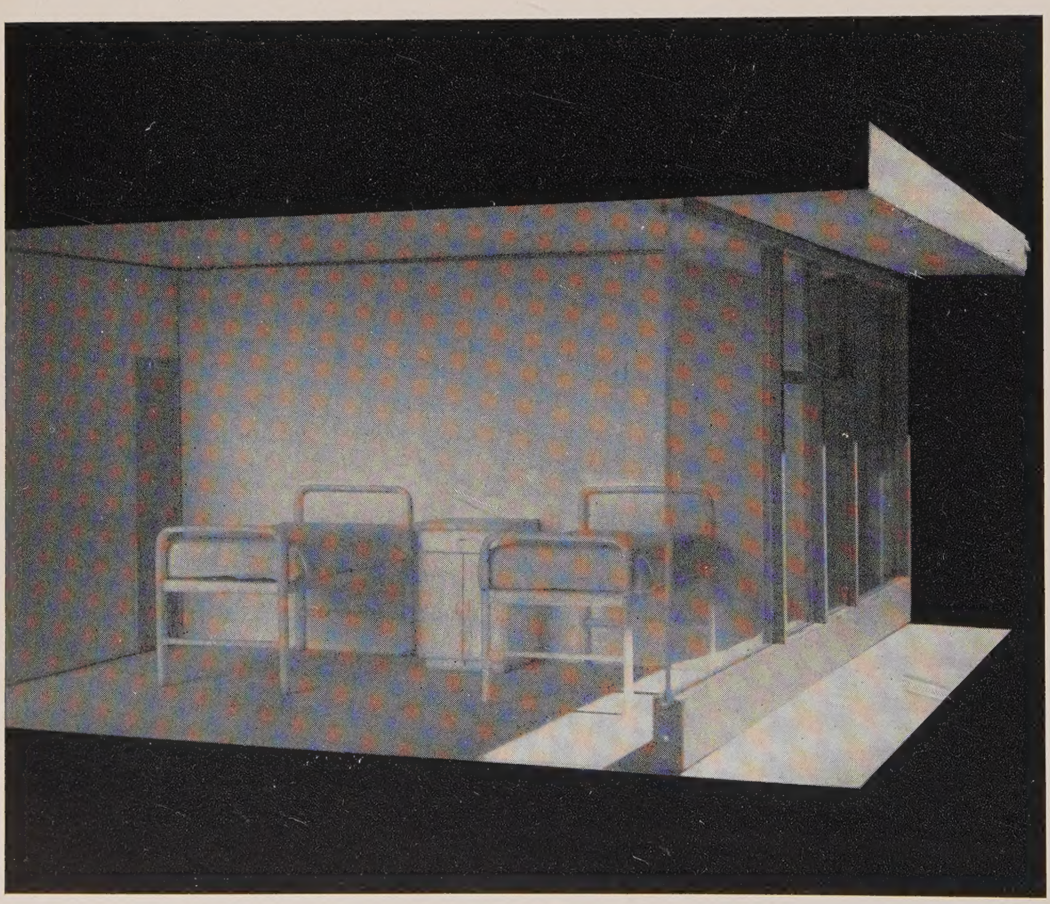
Cold facts appear to prove on each count that proper orientation for patients' bedrooms is mandatory. The scale models reproduced here illustrate what we are preaching and practising.

This question of orientation seems to be so important and so obvious that it is difficult to understand how it can be more or less ignored by the profession in its handling of hospital design. It seems to me to be a subject that can be settled once and for all. Is it important to have orientation or isn't it? As far as we are concerned, it is certainly embarrassing to us and undoubtedly confusing to our clients to have one so-called hospital architect make orientation a matter of life and death and to have another hospital specialist say orientation is unimportant, or at least of secondary importance. We have tried to analyze the pros and cons of the subject to draw up a sort of balance sheet, and to get a scientific answer to the problem.

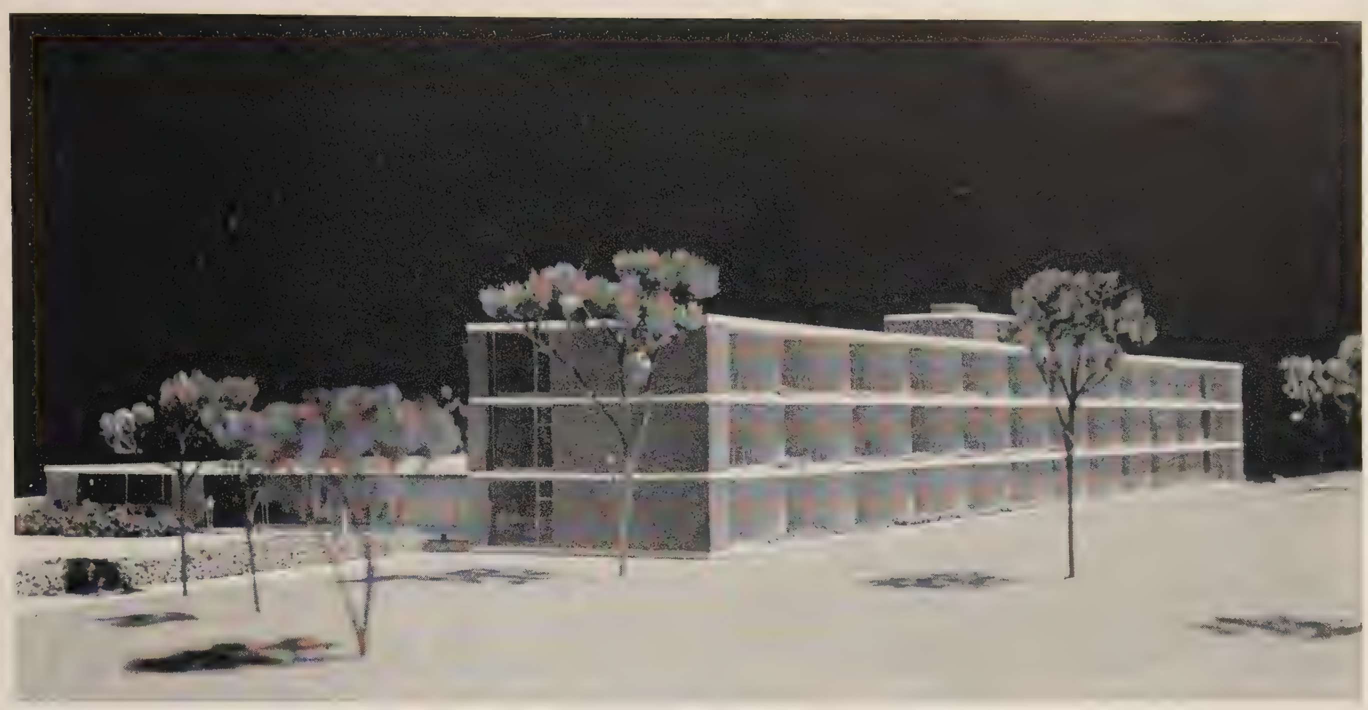
Architects' offices throughout the country are loaded with hospital projects. What comes off the boards of architects in this country during the next year or two will set a standard and influence the form of thousands of hospitals for the next twenty-five years. How many of them have incorporated orientation of the bedroom as a basic design principle? Probably not more than 10 per cent have. We should look at the implications



BEDROOM WITH SOUTHERN EXPOSURE AND ROOF OVERHANG. PENETRATION OF SUNLIGHT IN WINTER



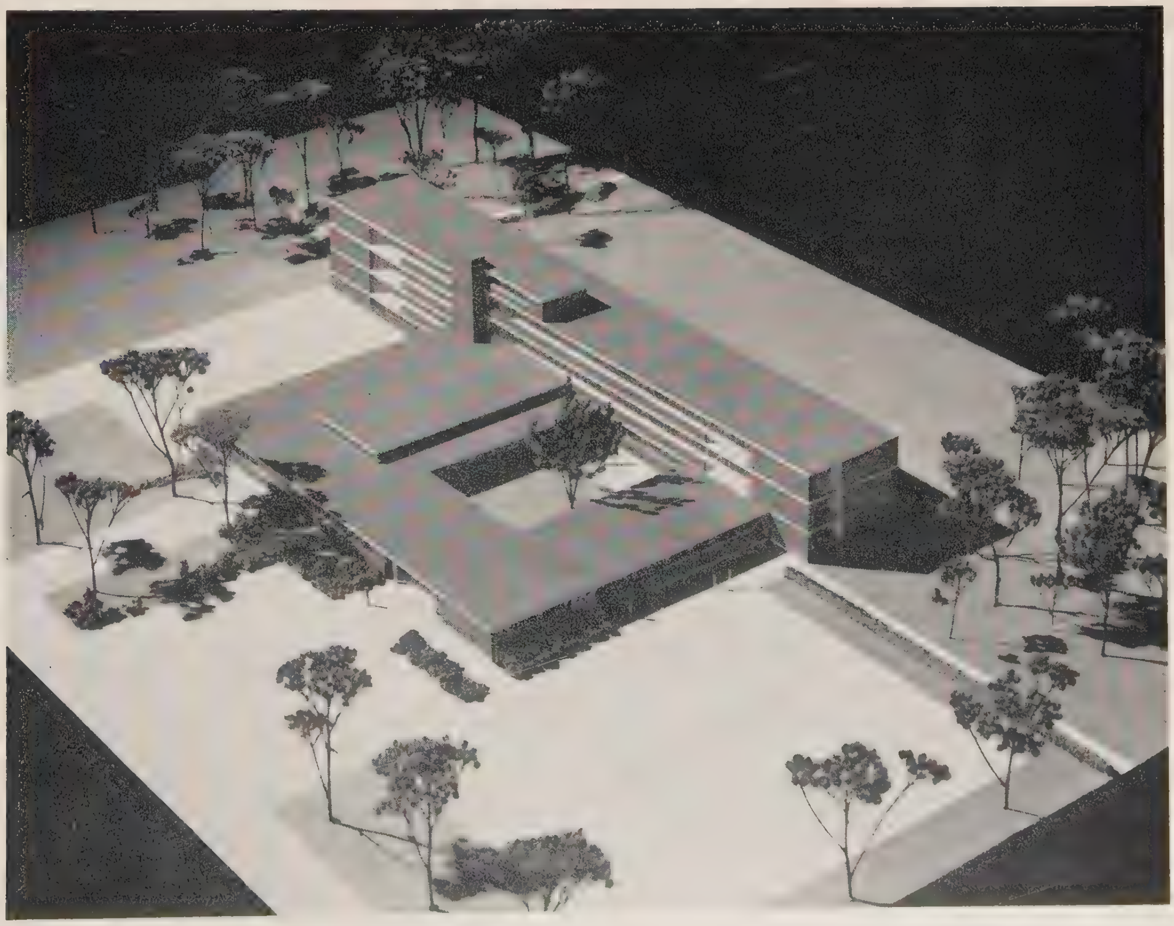
BEDROOM WITH SOUTHERN EXPOSURE AND ROOF OVERHANG. PENETRATION OF SUNLIGHT IN SUMMER



ORIENTATION IS THE PRIME CONSIDERATION IN CONSTRUCTION

MODELS OF THE SCHOITZ MEMORIAL HOSPITAL, WATERLOO, IOWA

SKIDMORE, OWINGS AND MERRILL, ARCHITECTS AND ENGINEERS, CHICAGO



Photographs by
Hedrich-Blessing Studio

inherent in accepting orientation to the south for all non-ambulatory patients' bedrooms. It sounds simple but it can be asked, what are the implications? Since bedrooms are arranged in blocks of from 20 to 30 to a nursing unit, since there are from two to three nursing units to a floor, since at least 90 per cent of the bedrooms must face the same way (which means, that they are all on one side of the corridor), and since these blocks of nursing units are stacked one above the other for economy of construction, we find that a pattern is developing—rigid in plan, section and elevation.

By making this one simple decision about orientation, some of the points that are settled are:

1. The type of site desired or the way a predetermined site must be used.

2. The plan and the section of the bedroom floors: The plan must be a straight line. It can have no irregular outlines on the south. The ancillary services must be on the north. X plans, Z plans and H plans are out.

Here are some of the ghosts that must be laid if, believing in orientation, one wants to see it executed in concrete, steel and glass:

1. *That it is more expensive to build because the beds are on only one side of the corridor.* The answer is that modern hospital technique and practice require the use of most of the north side of the corridor not already taken up by elevators, stairs and the like.

2. *That nurses must walk a greater distance to reach the bedrooms because of this type of plan.* The answer to this is a matter of fact. If the nurses' station is placed in the center of gravity of the bedrooms, she actually will have to walk a shorter distance on this type than on any other plan of which we know. (See floor plan).

3. *That because there would be too much glass, the heat loss in winter would be excessive, the strong sun entering in summer would be objectionable and sick persons would not want a lot of light.* A partial answer to these claims is the development of the permanent canopy, awning, or cantilever projection that is designed to admit sunshine in the winter and actually reduce the heat load, while barring the hot sun in the summer.

4. *That the exterior has a factory-like appearance and is ugly, monotonous, dry and sterile.* To these criticisms we have no answer except that we have no particular objections to factories and see no harm in repeating something, if one accomplishes the functional objective. We see no particular objection to hospitals of a similar size with a similar appearance.

On the other side of the ledger sheet is economy of construction through development of the ideal section and through clean simple repetitive detailing, the clean separation of the structure from the curtain walls of glass and metal, the ease of installation, and the obvious economy in maintenance and operation of the project.

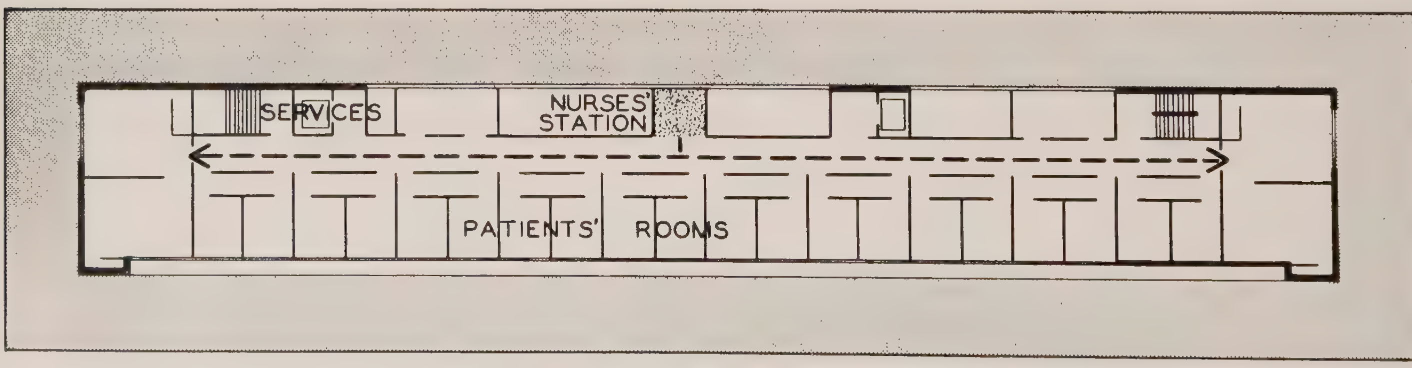
Esthetically, the relatively large amounts of glass, usually 8 x 10 or 8 x 12, tend to make a two-bed ward seem wide and open. They give the occupant of the second bed a chance at the view and create less objection to the two-bed ward.

A properly oriented building squeezes the last rays of sunlight out of dark and foggy winter months. It provides complete flexibility, since glass areas can always be reduced by curtains and then expanded when desired.

Having beds on only one side of the corridor permits better cross ventilation, cuts down noise, puts the utilities near the beds and thereby improves the nursing services.

The most important question of all is the one that cannot be weighed in dollars and cents directly or indirectly. That is the effect on the patient. The patient is, after all, the reason for the whole thing. Americans, almost to a man, are sun worshippers, and many spend their savings for a few treasured days in California or Florida. Why not introduce some of that sun into their community's hospital rooms? Perhaps the greatest single contribution that we as architects can make in the form of a permanent structural therapy, so to speak, would be to insist on creating health institutions that admit all the available sun to help our people get well faster.

*From August, 1947, issue of Hospitals*




FLOOR DIAGRAM SHOWING NURSES' STATION LOCATED IN THE CENTER ILLUSTRATES THAT TRAVEL TO ANY ROOM IS SHORTENED

# EFFICIENCY OF OPERATION

By NATHANIEL A. OWINGS

Skidmore, Owings & Merrill, Architects and Engineers, Chicago

## ECONOMY OF OPERATION

### Introduction

ECONOMY of hospital operation is attained by orderly arrangement of physical facilities and competent management of its affairs directly concerned with maintenance and effectiveness in serving the community. It involves all phases of hospital activity — the patient, the staff, the administration and the service department. An efficient hospital provides superior service to the community and the patient. It is able to contribute toward increased medical knowledge and is able to attract qualified personnel.

Major factors in the operation of a hospital include co-ordinated initial planning by the management and the architect. The architect provides the tools and the administrator exploits these tools by scientific management. Thus, the architect tries to achieve a design which will be efficient for the needs and uses of the hospital and its staff, and the administration schedules the use and operation of the plant, its equipment and personnel. A healthy community, satisfied patients and staff and economic operation is the goal to be achieved.

## THE PROBLEM

The aim of the architect is to consider the people involved in the hospital and the elements of the hospital and locate these elements so that they may be correctly and efficiently occupied. It would seem, therefore, that first an analysis must be made of the functions of people concerned with the hospital and the facilities employed.

### The People

The groups of individuals concerned with the hospital are as follows:

I. Public —
- In-patients
- Out-patients
- Visitors
- Volunteer Workers

II. Professionals —
- Staff
  - Doctors
  - Nurses
  - Internes
  - Student Nurses
  - Nurses' Aides
- Technicians
- Dieticians

III. Administrators —
- Business Manager
- Social Service Workers
- Medical Record Personnel
- Chief of Medical Services

IV. Service Personnel —
- Engineers
- Housekeepers
- Dietary

### The Hospital Elements

The hospital elements may vary somewhat with the nature of the hospital but basically they revolve around the nursing unit which houses all categories of in-patients, e.g., internal medicine, maternity, pediatrics, psychiatry, surgery, contagion, including tuberculosis, etc. Related to this area are the departments concerned with admitting and discharge, ancillary services for diagnosis and therapy, surgery and dietary. The out-patient department makes use of certain facilities in common with the in-patient department such as the business offices and rooms for diagnosis and therapy but has in addition its own clinics and treatment rooms. Housekeeping and maintenance serve both in the in-patient and out-patient areas, of course.

The elements of the hospital as herein described may be illustrated as shown in Figure 1.

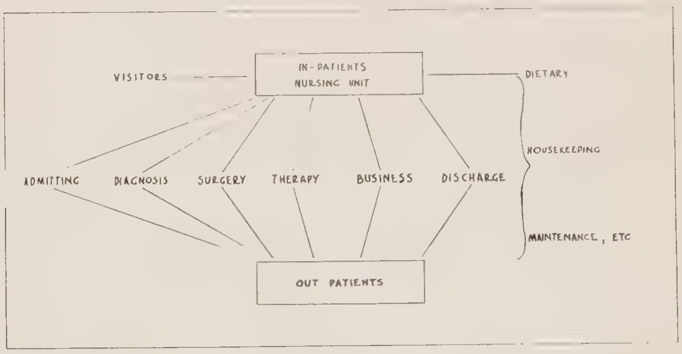



FIGURE 1

### The Relationships

Relationships within the hospital are on two levels. The first is inter-departmental, the other is intra-departmental. These factors must be correlated and interpreted in terms of the size of plant and size of staff in order to determine location of facilities.

Nursing units must have access to the admitting and emergency divisions including the records section and

social service sections. Diagnosis of patients requires the use of X-ray, laboratories and other ancillary services.

Usually there is a direct need for surgery or the maternity labor and delivery suites. From these operating suites the patients are distributed among the recovery and convalescence rooms in the nursing unit. From the nursing unit the patient is discharged through the business office and uses ambulance or passenger vehicle exits. The hospitalized patients bring visitors into the hospital which are directed from the reception desk. Kitchen services, laundry services and the maintenance services attend to the needs of the patients, staff and building. Administrators direct the work of students who assist the staff.

The out-patient departments make use of areas which directly serve hospitalized patients but there must not be conflict or overcrowding by either department.

Typical requisites for intra-departmental relationships are illustrated by those within the nursing unit which include bedrooms, nursing stations, examining rooms, utility rooms, linen supply, food handling facilities and access for visitors.

Figure 2 shows these relationships.

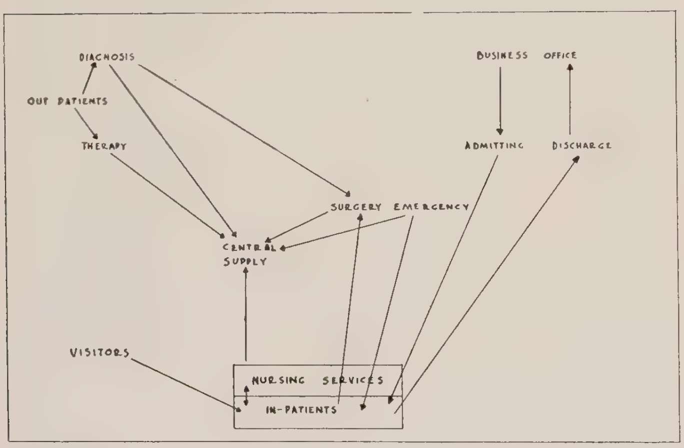



FIGURE 2

## THE SOLUTION

The efficient hospital must utilize its equipment and personnel to the greatest extent possible in order to reduce overhead costs. The design of the hospital must allow easy access to departments, reduce traffic and embody sufficient flexibility to take care of emergency situations.

### Location of Departments

Thus, it would seem logical that similar services should be grouped as closely as possible. Allied and auxiliary services should be easily accessible. The design of the hospital must be such as to group services and departments that are closely related with care to isolate or reduce odors, noise, traffic and other disagreeable factors. Traffic must be evaluated and channeled. The greatest possible amount of traffic should be accommodated as close as possible to the ground floor thereby decreasing noise, confusion and opportunities for contamination.

Surgery should be located near the nursing unit with easy access to emergency unless separate facilities are provided in the emergency ward. Similarly, ancillary services, e.g., laboratories, X-ray, pharmacy, physiotherapy, are used by both hospitalized and clinical patients for diagnosis and therapy. This would mean that these facilities should be located in an area accessible to all patients without unnecessary traffic through the nursing unit.

The sterile supply room should be centrally located unless there is a decentralized system common generally in larger institutions. Except where land is at a premium, surgery and ancillary services should be located in a separate wing and not located under patient areas. Thus, each department can be constructed to operate for its most efficient use without unnecessary restriction to fit architectural forms derived for specific needs of the basic nursing unit.

All departments of the hospital must be located so as to obtain adequate light and ventilation. Proper building orientation has been discussed in a previous article and need only be mentioned here. However, just as the patients are dependent on good light and air for recovery, so the morale of the staff of the hospital is materially aided and efficiency increased by desirable working quarters.

Each department must be located so that it is accessible but so that through traffic is kept at a minimum. This factor applies throughout the building in all departments regardless of their relationship to the nursing unit.

### Location of Facilities with the Department

As already emphasized, every effort must be made to reduce travel distances of the personnel and patients. To obtain more economical use of personnel, for instance, the X-ray and radiation equipment or basal metabolism and cardiographic equipment or various therapeutic facilities may be operated by the same technicians. Hence, related facilities should be as close as possible to one another.

Good design aims for convenience, minimum travel for nurses, maximum accessibility for all auxiliary services and quiet for the patient. By judicious placement of the nursing station and auxiliary services, there is complete observation of the floor at all times. There is control of traffic and visitors and it conserves the nurses' energy by reducing needless travel previously required. The service staff of the hospital can supply the needs of the unit with a minimum of disturbance.

Figure 3 shows relationships and location of the elements and facilities of the hospital.

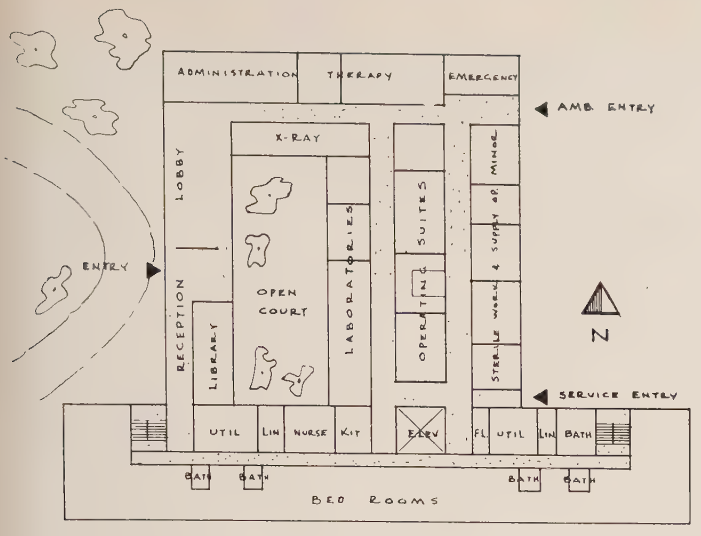



FIGURE 3

An illustration of the need for thoughtful organization of a relatively complex hospital is well illustrated by the planning of facilities for food handling. The food service is a very important part of the in-patient care. Unless the patient is on a special diet, the bulk of the cooking and food preparation is in the main kitchen. The kitchen is so located as to be able to reach each floor housing the bed patients and ambulatory patients and also the staff dining room.

There are three principal ways of handling the food service to the bedridden patient. They are:

1. Central tray service. The food is prepared and put on trays in the kitchen.
2. Decentralized tray service. The food is sent up to each floor and then is put on trays that are taken to the patient.
3. Bedside service. The food is sent up to the kitchen on each floor where trays are prepared only as to basic necessities including silverware and utensils and then the food is brought in on carts to the patient.

Under the central tray service the results are not satisfactory particularly in the large hospitals because if everything is kept in a food warmer, the butter melts, the bread is dried and the food is not generally palatable. The decentralized tray service places too great a burden on the nurses and the aides who serve the food and it is difficult to keep the proper foods warm, particularly in the larger patient areas of the hospital. The bedside service has proved to be not only the most efficient but also the most pleasant as far as the patient is concerned since he is given an opportunity to select the amount of the portion of his food within reason and also because the temperature requirements of the different types of food may be more closely regulated.

### Maintenance and Administration

Maintenance of a well designed plant is easier because of separate areas of use and equipment. Good maintenance increases the life and utility of the plant and its equipment and is an important factor in reducing costs.

Administrative quarters with ready access to the entire hospital eases the way for proper management. Personnel and equipment will be more efficiently employed and will result in a greater return for the hospital.

It should be mentioned that the science of hospital management is an ever expanding field. More and more institutions are recognizing and developing aids to increase efficiency through this branch of business.

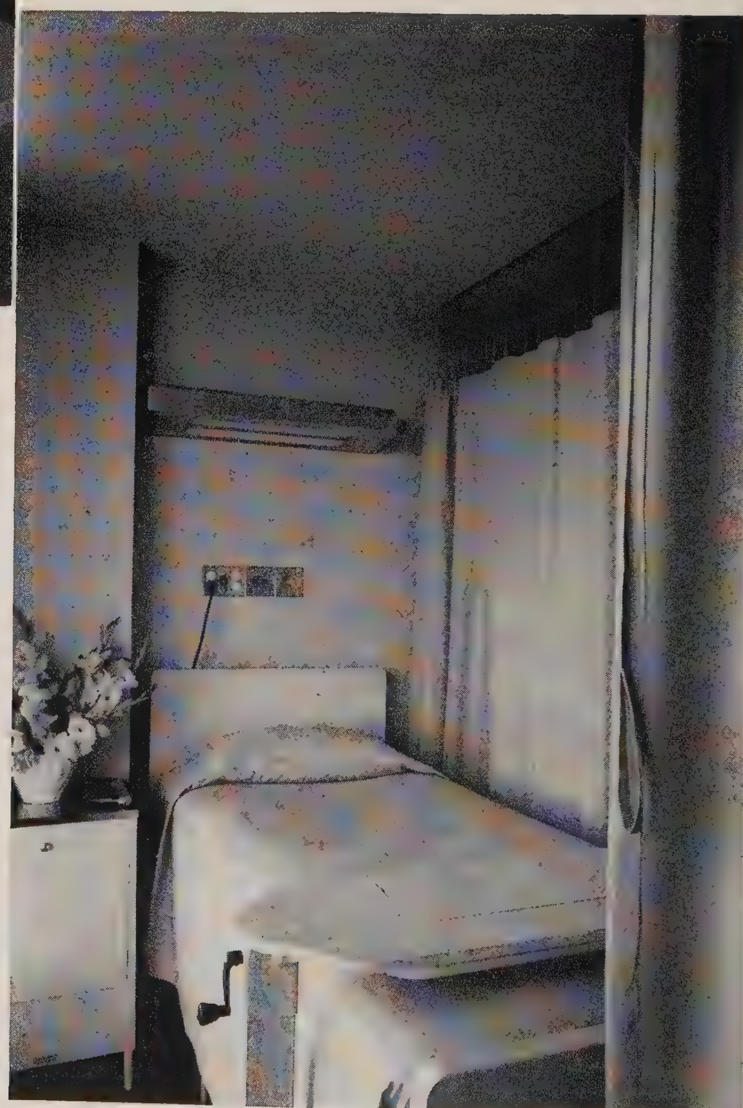
## CONCLUSIONS

Fixed rules cannot be applied to a given situation because of the peculiar problems involved. Certain generalizations may be made, however, that assist in obtaining a maximum of economy in hospital operation through plant design.

Four main items must be adhered to in the design of a hospital for its maximum efficiency. Briefly summarized they are as follows:

1. Reduce the steps.
2. Achieve better lighting and ventilation.
3. Group services according to use.
4. Group elements and departments for the removal of odors, noise and traffic, and all opportunities for contamination.

The patients that are hospitalized and those coming for clinical treatment will welcome a well-run institution which gives them a greater sense of security and interest. The personnel will be attracted to and will be satisfied by a well-run institution. This satisfaction will in turn become the best means of public relations for the hospital in the community it serves.



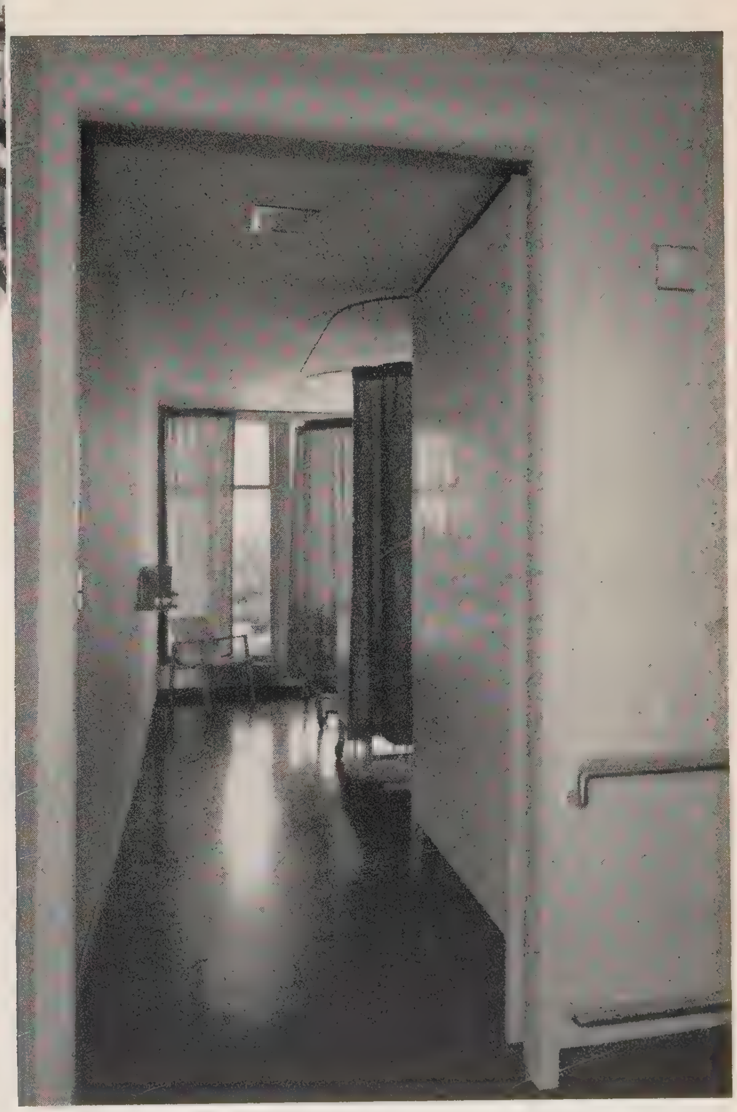
TYPICAL BEDROOM UNITS

Photographs by Roger Sturtevant

Photographs by Roger Sturtevant

TYPICAL BEDROOM UNITS
MOUNT ZION HOSPITAL, SAN FRANCISCO, CALIFORNIA
MILTON T. PFLUEGER; SKIDMORE, OWINGS AND MERRILL, ASSOCIATED ARCHITECTS

MOUNT ZION HOSPITAL,
SAN FRANCISCO, CALIFORNIA
MILTON T. PFLUEGER;
SKIDMORE, OWINGS AND MERRILL,
ASSOCIATED ARCHITECTS



# RÉSUMÉ

**Full Size Demonstration Model of Semi-Private Room, Mount Zion Hospital**

## ORIGINAL DESIGN

### Corridor

Asphalt tile floor, metal recessed base, upper and lower stainless steel rails to protect plaster walls. Upper rail at height to also serve as hand railing. Ceiling treated with Johns-Manville metal covered acoustic tiles applied to surface of the ceiling. These held in place on channels. Tiles are removable for access to ducts and wiring for maintenance.

Lighting consists of 8′-0″ long, stainless steel, slim line, recessed fixture on each side of 12″ square incandescent fixture 24′-0″ on centres in the middle of the corridor.

Incandescent fixtures wired for use as both night lights and emergency lights.

Another night and emergency light was tried 2′-0″ above floor in side walls on 24′—0″ centres. These were recessed louvre-front fixtures. They were abandoned, however, as the ceiling light was more satisfactory and gave better light.

Only other light is dome light for nurses' call at each patient's room door.

Ceilings painted white and walls light yellows (maize). Floor is black mottled with grey.

Patients' doors are white maple with light natural finish. Hardware on corridor side is stainless steel push plate and kick plate. On inside of door is arm hook and recessed concealed door check. This is necessary due to ceiling-height door swinging in against wardrobe.

### Patients' Room Entry

Specially designed wardrobe with two identical sides in two-bed wards, each containing hanging space for clothes, drawers for underthings, shelves for blankets, and compartment above for suitcases. Door pulls are Architects' design.

Door to bathroom is opposite wardrobe so that all doors would be in entry and move in room. Door to bathroom swung into bathroom due to restricted area of entry. This made it necessary to design special door stop to be installed in the jamb in case patient was trapped in bath, or fainted against door. This consisted of 4″ long rubber stop held in position by spring in box mounted in jamb. Nurse could push in stop, and swing door into corridor on double acting hinges.

Entry lighted by 10″ square recessed flush incandescent fixture.

### Toilet

Lavatory, toilet and bed pan spray mounted back to back with those in adjoining toilet against pipe space, thus centralizing plumbing.

Toilet equipped with large mirror, recessed shelf for toilet articles, emergency button for nurses' call, grab and paper holder for water closet, and two 18″ chrome plated towel rods each to take bath towel, face towel, and wash rag.

Water closet wall-hung type with lugs to hold bed pans when being washed. W.C.'s flush jet.

Floor and base ceramic, unglazed tile. Floor and ceiling Keene's cement plaster painted pale green.

Light over mirror fluorescent, with integral receptacle operated by wall switch at door.

Exhaust is through grille in toilet ceiling.

### Patient's Room

Asphalt tile floor same as corridor, metal recessed base. All door jambs steel, baked enamel finish. Walls and ceiling plaster painted pale green.

Heating by tempered air through grille over entry and by convector type radiator under south window. Latter concealed by specially designed brushed aluminium cover, pierced on top and open beneath. Zone temperature to be used.

Windows from floor to ceiling approximately 12′-0″ high. 4′-0″ section opposite entrance door is double hung operating on sash balances, the remainder of the window is fixed. Operating section easily accessible to nurse even when curtains drawn around bed. Window is shielded by 4′-0″ overhang of floor above.

Window shaded by two shadow proof linen shades on rollers and by full length draw curtains on recessed ceiling track.

Bed space can be divided into two cubicles by drawing curtains hung from tracks in ceiling. Bed curtains about 1′-0″ off floor and suspended 1′-0″ from ceiling, on stainless steel rods.

Window and bed curtains and bed spreads all of the same pale green Goodall fabric — part wool and part cotton.

Over bed is mounted wall plate containing audible nurses' call system and two wall receptacles.

Room is lighted by night light 2′-0″ up on wall opposite bed and by specially designed over-bed lights. Latter are of stainless steel with fluorescent tubes. Night

light operates by switch at entry door, and over-bed lights by 4-way switch activated by pull chain. First pull turns on reading light underneath, second turns that off and turns on indirect light on top of fixture, third pull turns on reading light again, and fourth pull turns out both lights.

Double telephone jack is mounted on wall between beds.

Beds are of new Simmons patient operated type. Over-bed tables are Hill-Rom single pedestal type with vanity and mirror built into top. In addition, the room was equipped with two Simmons non-tip footstools, two light aluminum patients' chairs, two Simmons bedside tables. Bedside tables are to hold bed pans.

One or two easy chairs are to be placed in each room.

On wall opposite beds was mounted a wood shelf held by chromium plated brackets. This shelf is for flowers, books, and magazines.

## GENERAL IMPRESSION

The general impression of the room is marvelously bright, sunny and cheerful. The large window affords an interesting and ever-changing view over the city. The room seems much larger than it actually is because it does not seem to stop at the window but at the outside edge of the overhang. The cheerfulness is augmented by the decorating. The finish of the light maple woodwork is carried out in the furniture and the green of the walls and ceiling is repeated in the window drapes and bed-spreads and curtains. The dark floor throughout ties the whole together. All the metal is brushed chrome, aluminum, or stainless steel which impart a feeling of refined elegance.

## EXPERIMENTS

Upon completion, the staff experimented with the room.

### Corridor

In the corridor, gurney, laundry trucks, slop bucket, and dollies were tried against the guard rails. They worked perfectly.

Push plate on door was found too narrow. When door was opened to its maximum 90° angle, both edges were found vulnerable to injury by beds and gurneys passing through opening.

### Entry

The wardrobe opposite the toilet door was found to be in the way when moving bed nearest the window into the corridor without disturbing the patient nearest the toilet wall. Bed could just barely be maneuvered, but it was very difficult. Wall shelf had to be removed to do it. Special door stop and double acting hinges on toilet door were found complicated and expensive.

### Toilet

A medicine cabinet in place of plain mirror was found desirable for keeping patients' private medicines. 24" towel rods were found better than 18" ones so that wet wash rag would not have to be placed over bath towel. Toilet seat was raised 2" over former normal height, to make it easier for patients.

### Patients' Room

Beds were maneuvered in and out of the room, and gurneys brought in to transfer patients to beds. Traction apparatus was placed on beds, intravenous stands were put on one side of beds, oxygen tents over beds, and oxygen control cabinets placed on the other side of the beds from the intravenous stands.

There was barely space for the oxygen control cabinet between the innermost bed and the toilet wall, but there was no space for the nurse to squeeze through behind it to adjust the tent and operate the control cabinets.

The difficulty encountered in moving beds has been described above. This was partly due to the fact that the new Simmons beds used were 84" long. The same was true to a lesser extent with the gurneys. Room side of wardrobe was also found vulnerable to injury by furniture.

The over-bed lights were found too low to clear the traction bars on the head of the bed, and the room was not wide enough to conveniently pull the beds forward so that the traction bars could clear the lights.

Some method was deemed desirable to keep the beds and bedside cabinets off the walls to protect the plaster.

A valance was considered desirable to hide the roller of the linen shade.

The deck outside the window when painted the original grey caused considerable glare in the room, as did the exterior aluminum window sill.

Fluorescent lights, particularly with the green walls, were found to reflect an unflattering light upon persons in the room at night, although when there was any sunlight in the room, this was not the case.

It was thought desirable to incorporate a wall receptacle outlet in the night light on the east wall.

## REVISIONS TO ORIGINAL DESIGN

Push plate on corridor door was doubled in width.

Entry to room was rearranged as shown in plan.

Offset hinges were put on corridor door to throw it clear of opening when opened. Toilet room wall was brought forward to form recess for corridor door when open and protect it. End of this projecting wall was protected with stainless steel edge casing.

Medicine cabinet installed in place of mirror in toilet.

Water closet seat raised 2".

Towel rod increased from 18" to 24" in length.

Entry widened and patient's room deepened by making toilet smaller and making partitions enclosing it 3" instead of 6".

Door of toilet placed on room side with 3 ordinary hinges.

Projecting member added to base along west wall to protect plaster from beds and bedside tables.

Valance added at head of window to cover shade.

Receptacle added to night light.

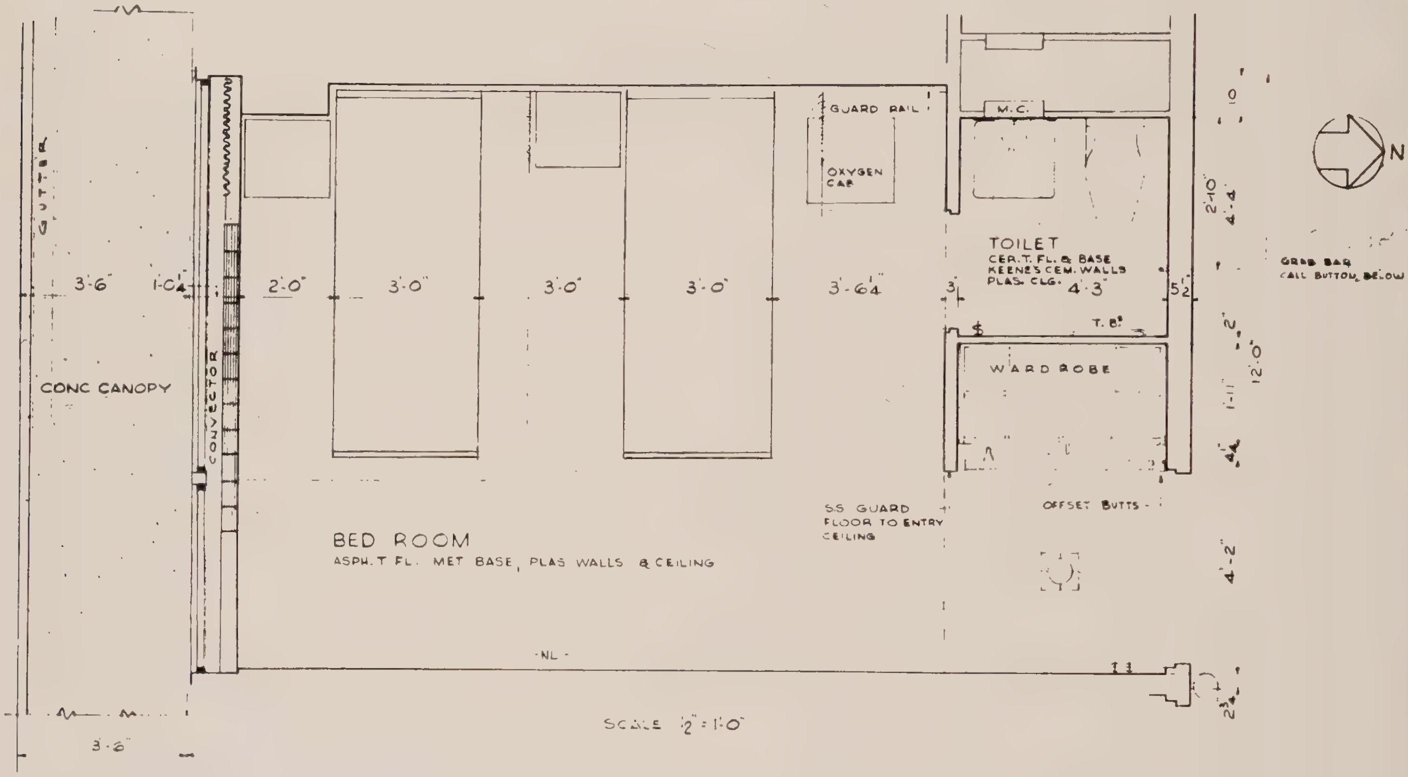
Over-bed lights and nurses' call plates raised on west wall.

Central oxygen outlet added to these over-bed plates.

Patients' room was painted a lighter green than at first.

Deck outside window painted forest green to stop reflected glare.

Flower boxes added and placed on outer edge of deck. This gave feeling of protection. Made it easier to wash windows and allowed drain for overhang to be combined with drainage of flower boxes.




PLAN OF MODEL BED ROOM, MOUNT ZION HOSPITAL, SAN FRANCISCO

NEW MOUNT SINAI HOSPITAL, TORONTO

KAPLAN & SPRACHMAN, GOVAN, FERGUSON, LINDSAY, KAMINKER, MAW, LANGLEY, KEENLEYSIDE, ASSOCIATE ARCHITECTS
J. J. GOLUB, M.D., CONSULTANT

ST. JOSEPH'S HOSPITAL, HAMILTON, ONTARIO

MARANI AND MORRIS, ARCHITECTS


HOSPITAL FOR SICK CHILDREN, TORONTO

GOVAN, FERGUSON, LINDSAY, KAMINKER, MAW, LANGLEY, KEENLEYSIDE, ARCHITECTS

Drawing by Basil Ludlow

**QUEEN ELIZABETH HOSPITAL, TORONTO, ONTARIO**

**E. R. ARTHUR; MARANI AND MORRIS, ARCHITECTS**

Photographs by Warner Bros.

SOLARIUM ON ROOF

PRIVATE ROOM

SUN ROOM

VIEW OF TYPICAL DIET KITCHEN

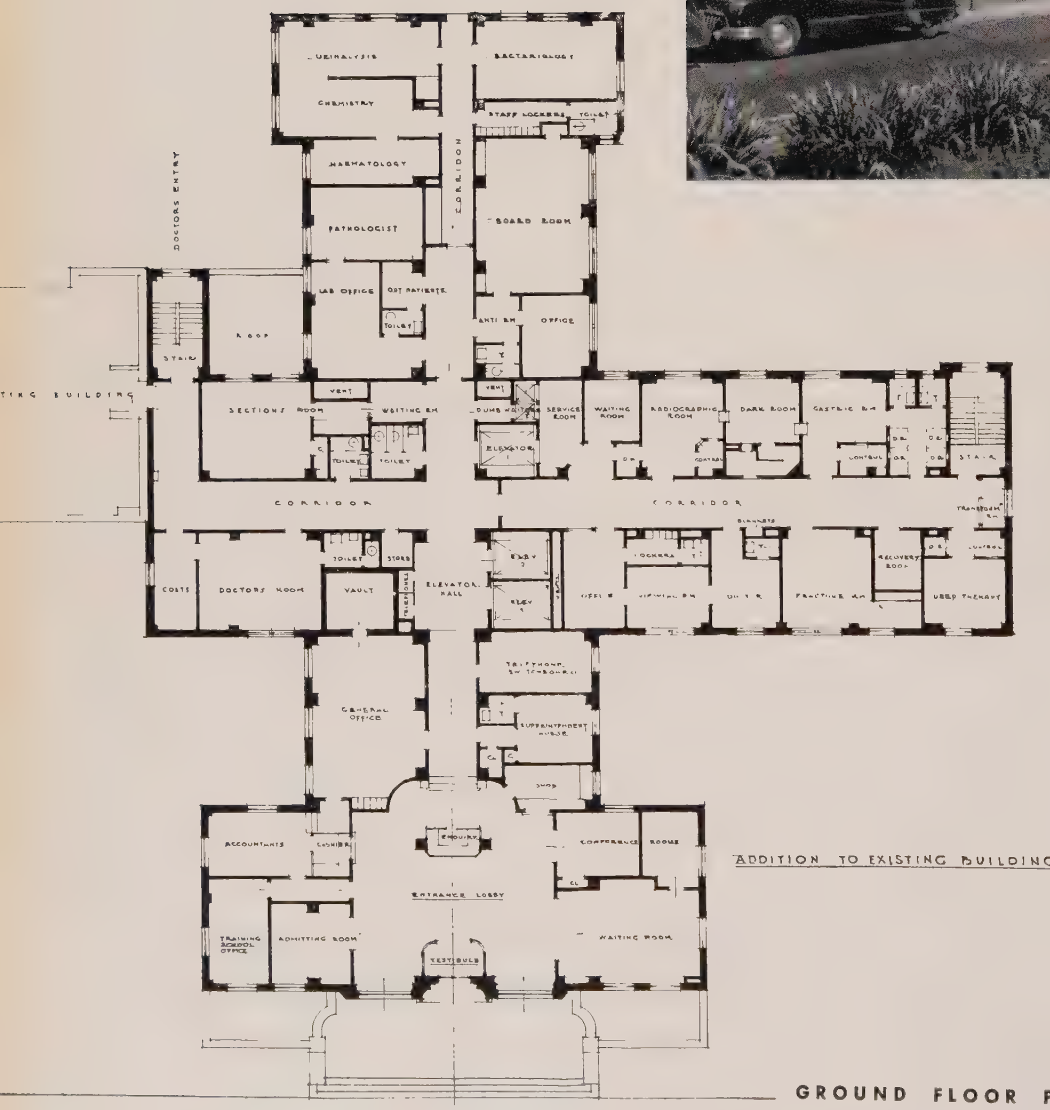
PRIVATE BATHROOM

HYDRO THERAPY ROOM, ILEY TANK

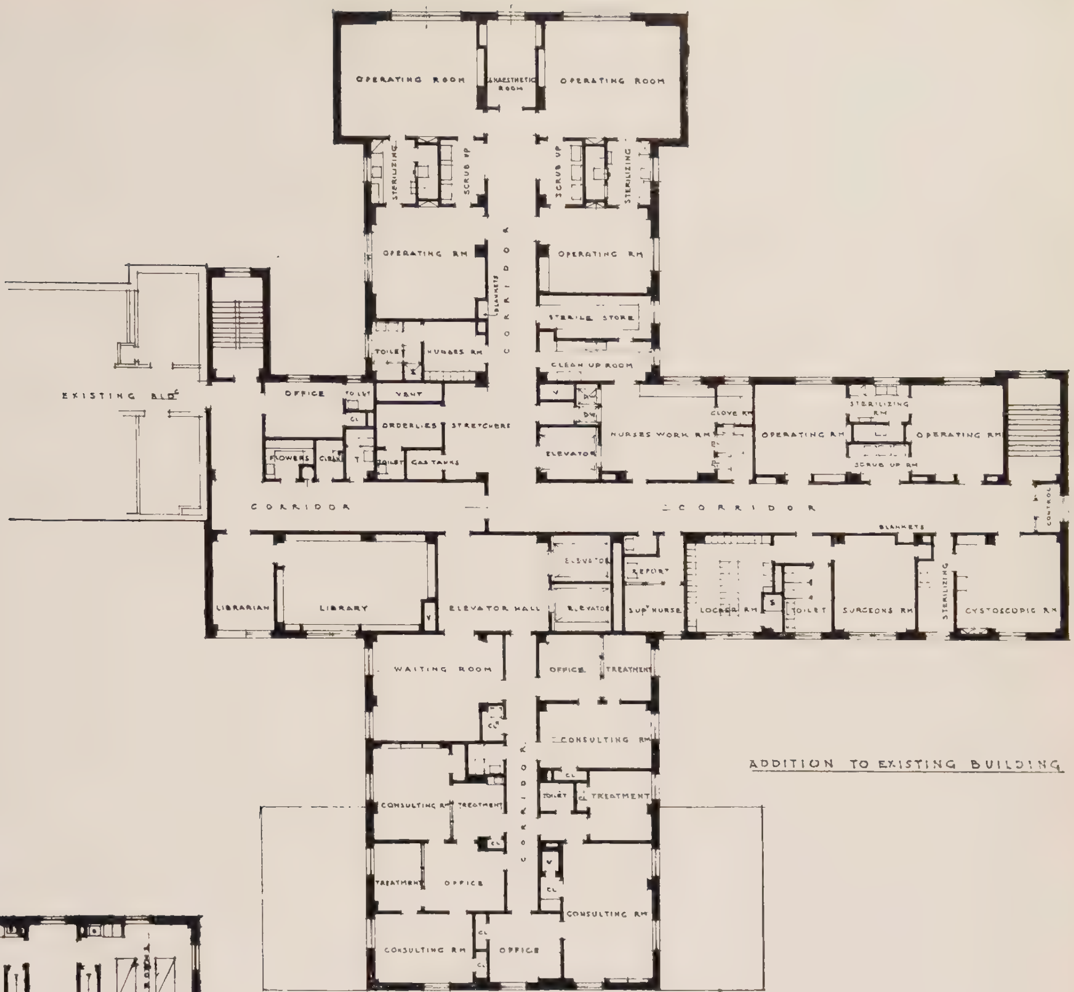
WELLESLEY HOSPITAL,
TORONTO, ONTARIO

D. E. KERTLAND,
W. L. SOMERVILLE,
ASSOCIATED ARCHITECTS

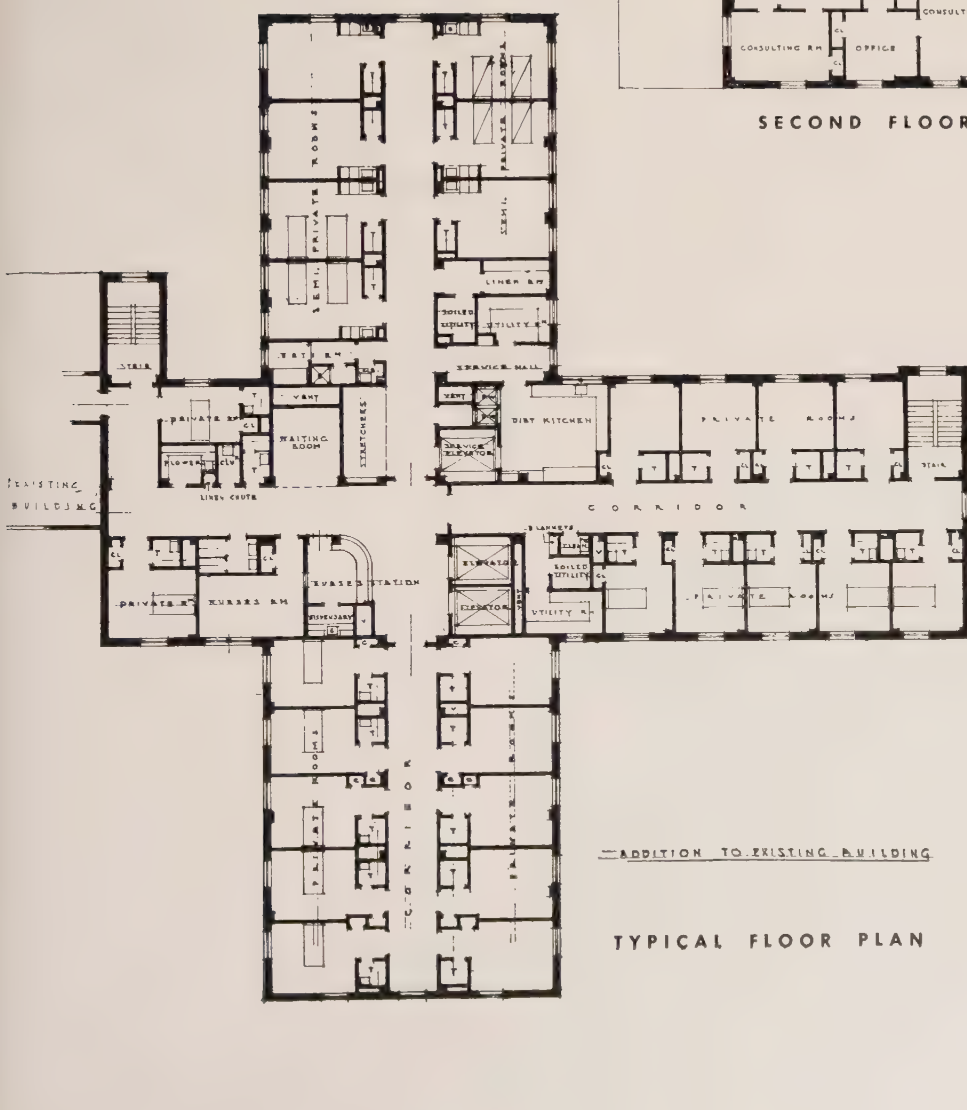
Photographs by Panda




GROUND FLOOR PLAN



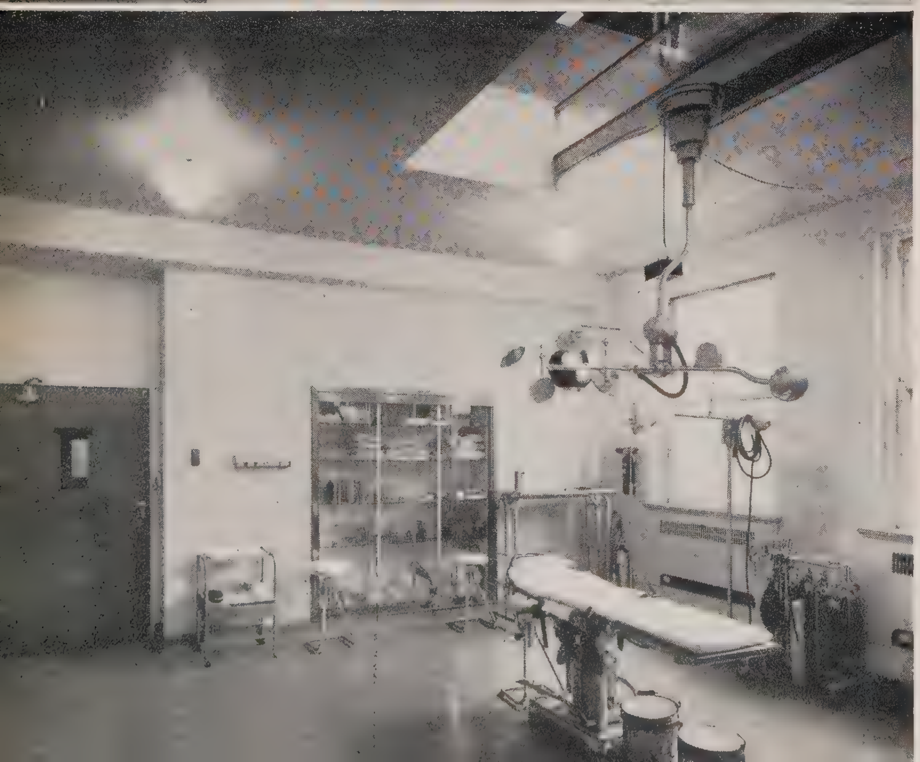

SECOND FLOOR PLAN




TYPICAL FLOOR PLAN

ENTRANCE LOBBY

MAIN ENTRANCE

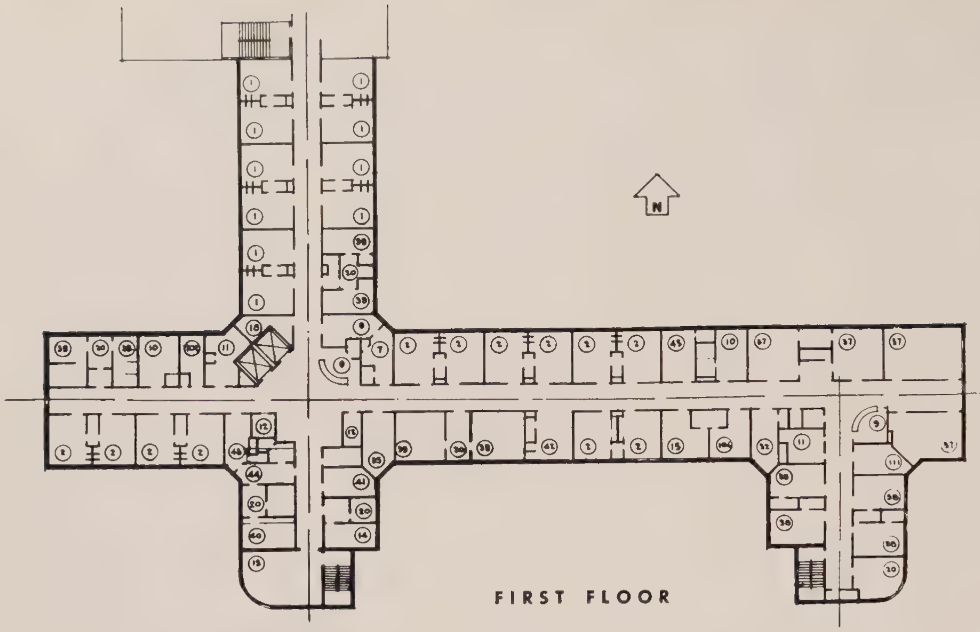


OPERATING ROOM

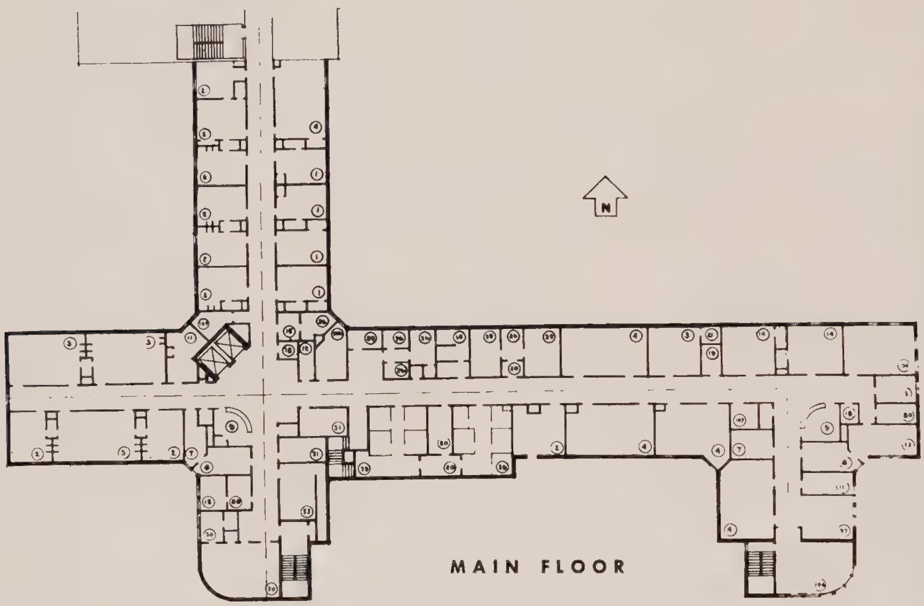
ADDITION TO UNIVERSITY OF ALBERTA HOSPITAL, EDMONTON, ALBERTA

G. H. MACDONALD, ARCHITECT

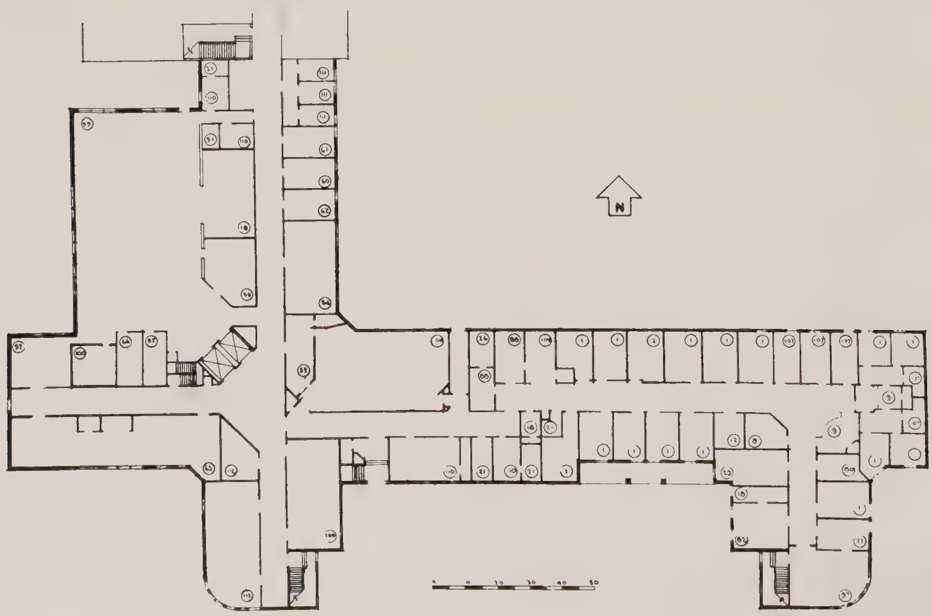
OFFICE OF W. L. SOMERVILLE, ASSOCIATE ARCHITECTS



FIRST FLOOR



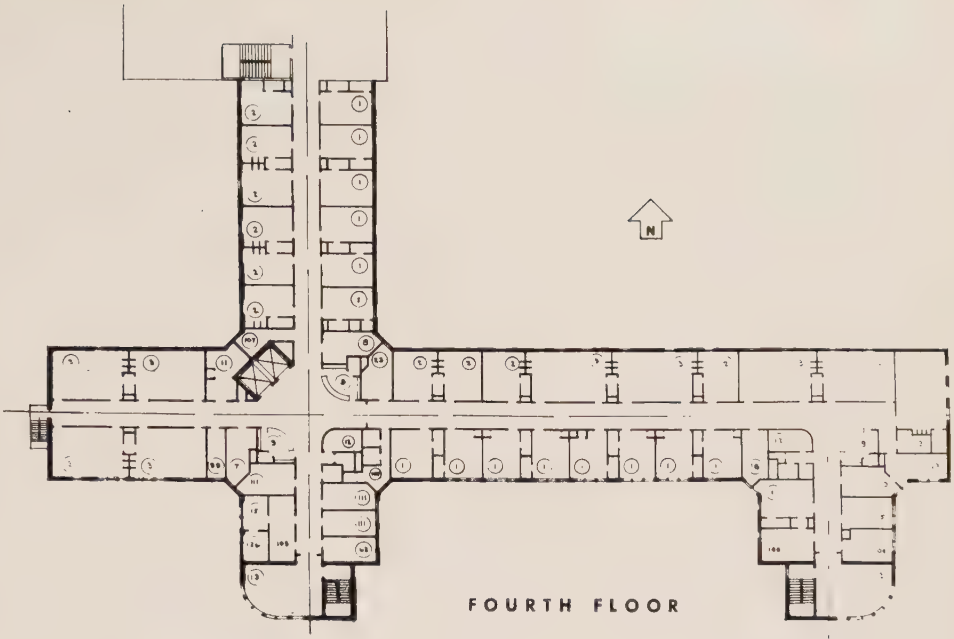
MAIN FLOOR



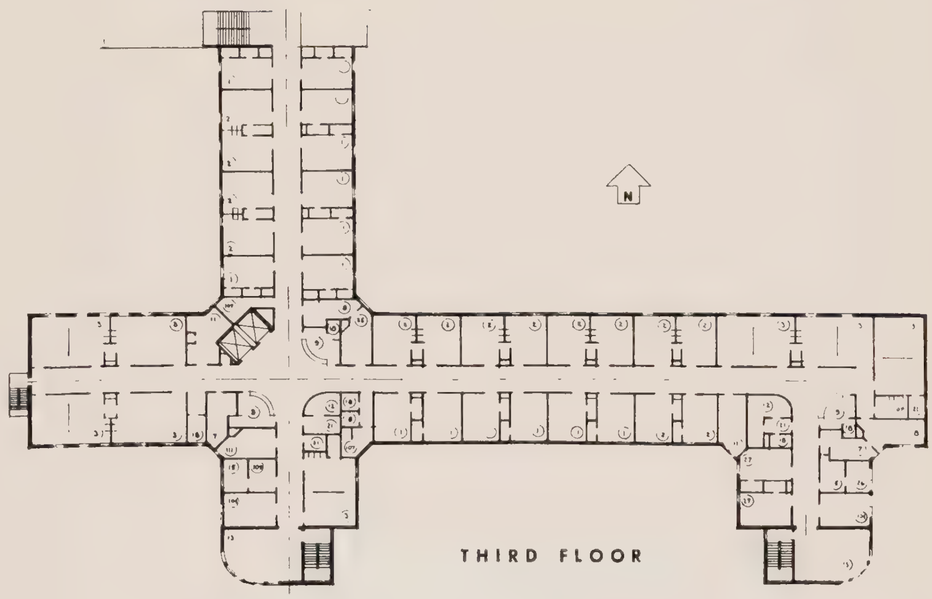
LOWER GROUND FLOOR

1. One Bed Ward
2. Two Bed Ward
3. Four Bed Ward
4. Six Bed Ward
5. Nine Bed Ward
6. Twelve Bed Ward
7. Soiled Utility
8. Clean Utility
9. Nurses' Station
10. Nurses' Room
11. Servery
12. Linen
13. Solarium
14. Isolation Ward
15. Doctors' Room
16. Flowers
17. Visitors
18. Storage
19. Utility Room
20. Work Room
21. Lavatory
22. Service Room
23. Treatment Room
24. Balcony
25. Pack Room
26. Examination
27. Quiet Room
28. Major Operating Room
29. Minor Operating Room
30. Sterilizing
31. Equipment
32. Preparation
33. Emergency Operating
34. Anaesthetic
35. Surgical Dressing
36. Recovery Room
37. Delivery
38. Labour
39. Nursery
40. Premature Nursery
41. Mothers Instruction
42. Patients' Lounge
43. Fathers' Room
44. Charts
45. Students
46. Cystoscopic
47. Radiography
48. Dark Room
49. Gastric
50. Physiotherapy
51. Fracture Room
52. Tonsils
53. Refraction
54. Bio. Chem. Lab.
55. Fluoroscopic
56. Aspiration

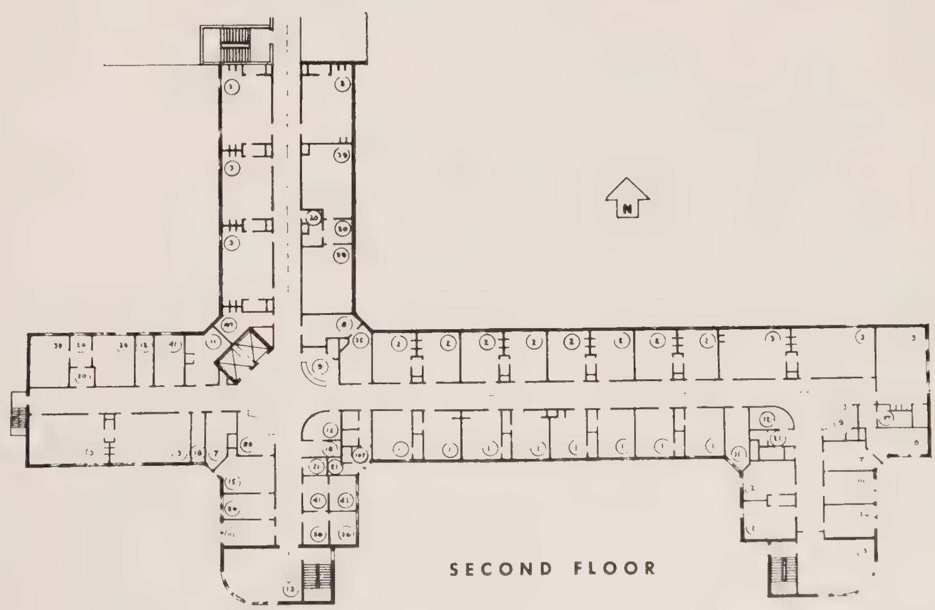
57. Hydrotherapy
58. Chemical Lab.
59. Pharmacy
60. Haemotology
61. Bacteriology
62. Urine Lab.
63. Central Supply
64. Dental Lab.
65. Eye and Ear
66. Formula Room
67. Plaster Casts
68. Dispensary
69. Morgue
70. Autopsy
71. Clinic
72. Dressing Room
73. Lobby
74. Admitting Room
75. Fitting Room
76. Brace Shop
77. Sewing Room
78. Crafts Room
79. Splints
80. Patients' Clothing
81. Lamp Room
82. Occupational Therapy
83. Gym
84. Library
85. Auditorium
86. Enquiry
87. Switchboard
88. Office
89. Secretary
90. Housekeeper
91. Matron
92. Superintendent
93. Dietician
94. Bursar
95. Post Office
96. Chapel
97. Dining Room
98. Cafeteria
99. Kitchen
100. Refrigerators
101. Laundry
102. Lunch Room
103. Refectory
104. Classroom
105. Common Room
106. Internes' Room
107. Bath
108. Living Room
109. Waiting Room
110. Locker Room
111. Laboratory
112. Unassigned



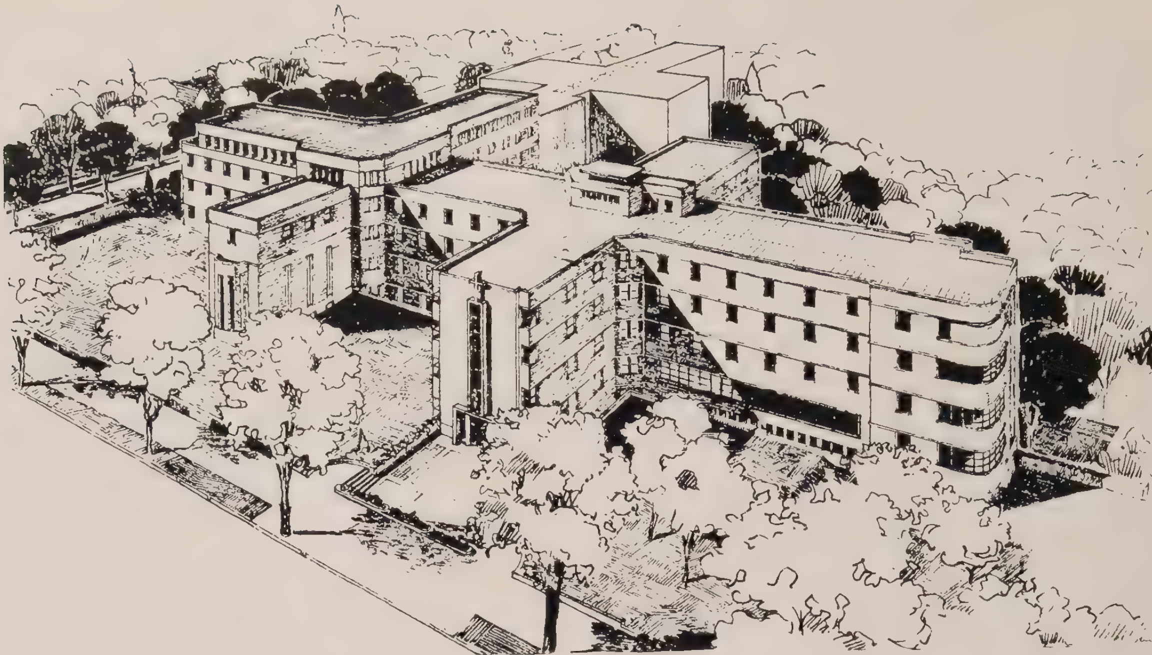
FOURTH FLOOR



THIRD FLOOR

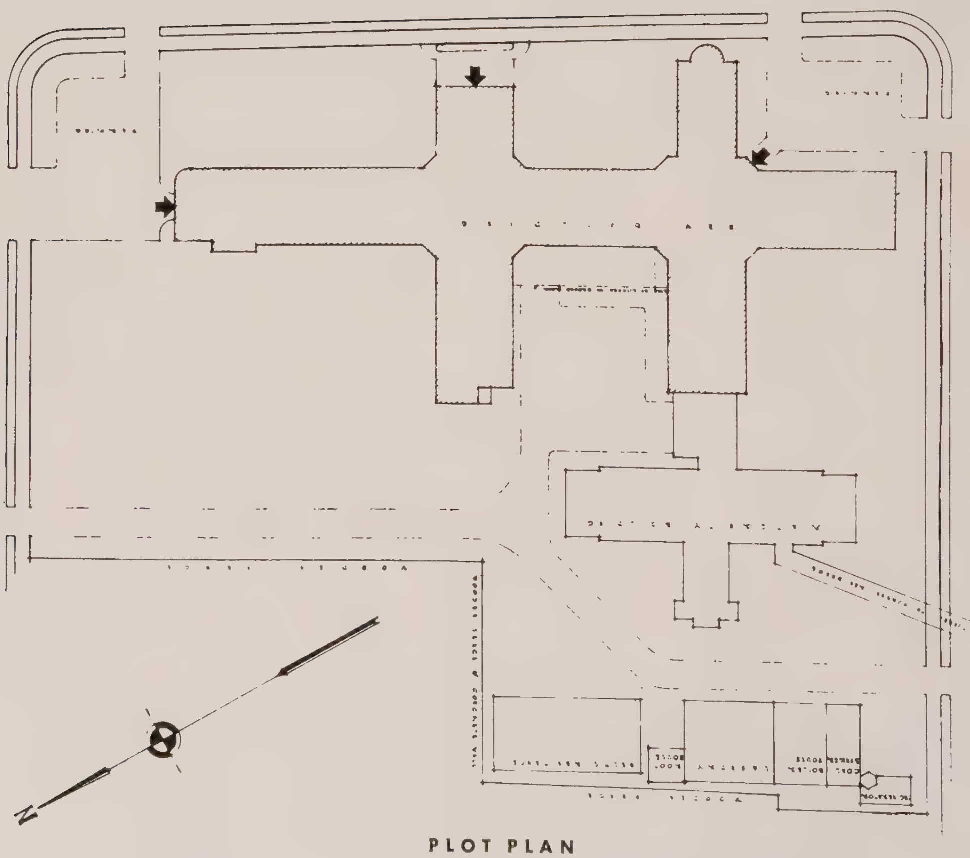


SECOND FLOOR

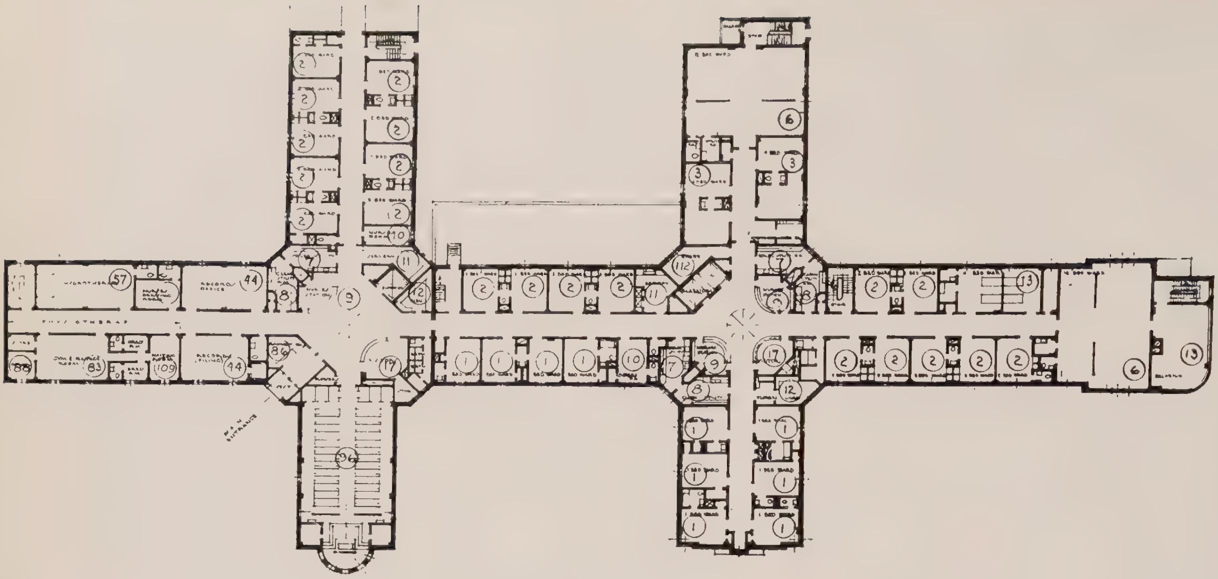


ST. JOSEPH'S HOSPITAL, HAMILTON, ONTARIO

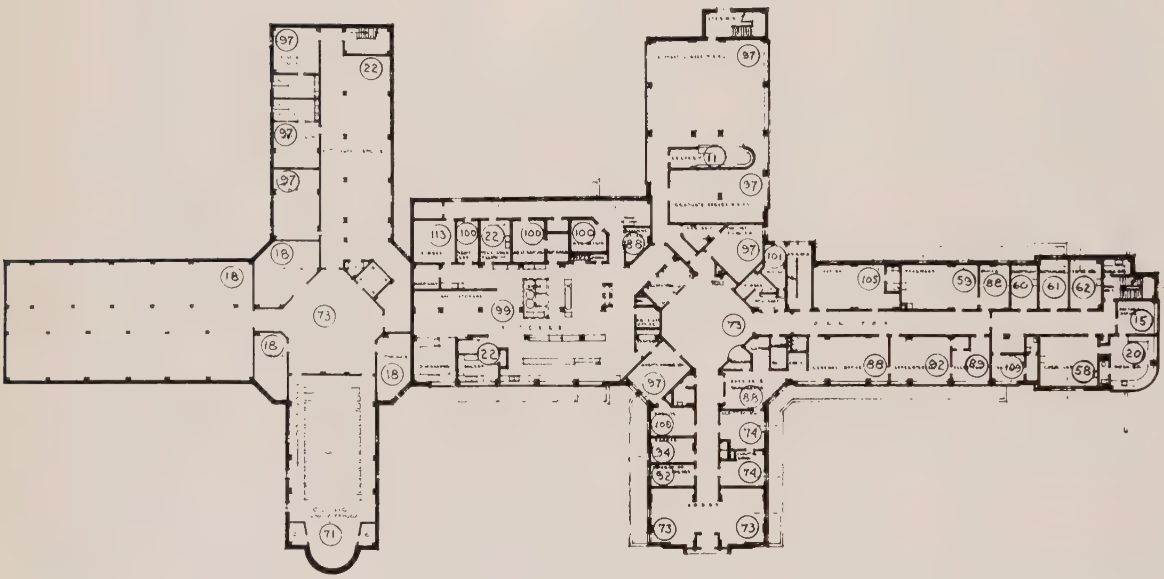
OFFICE OF W. L. SOMERVILLE, ARCHITECTS



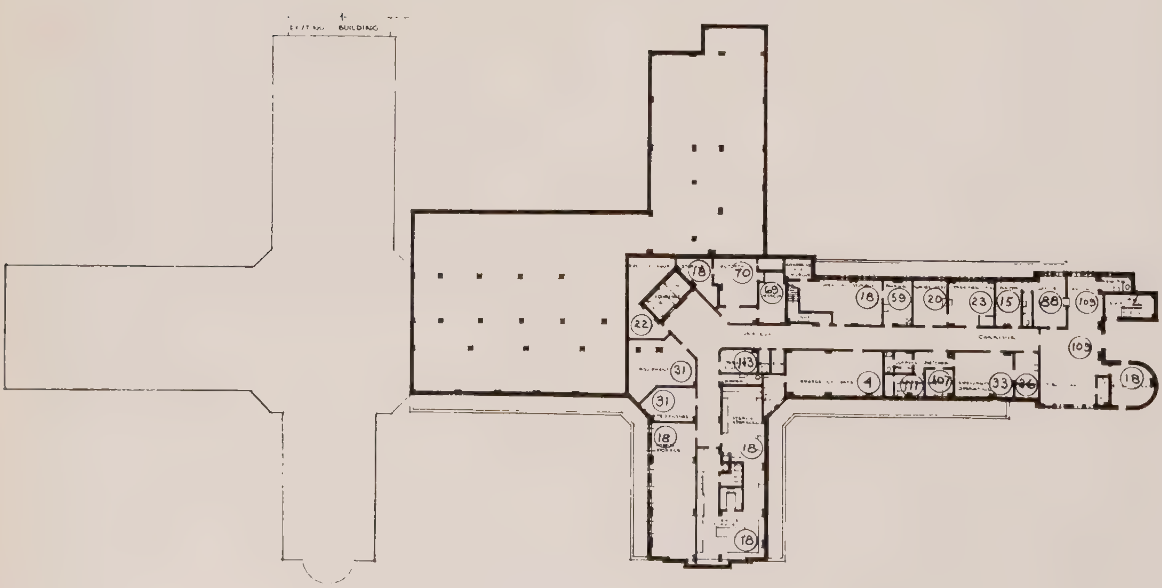
PLOT PLAN



FIRST FLOOR



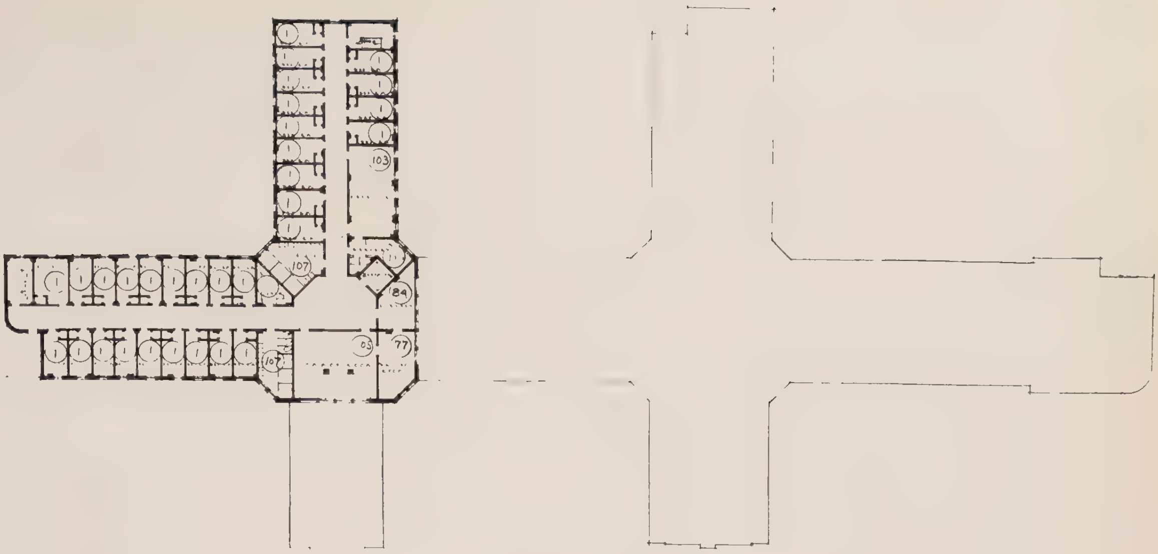
GROUND FLOOR



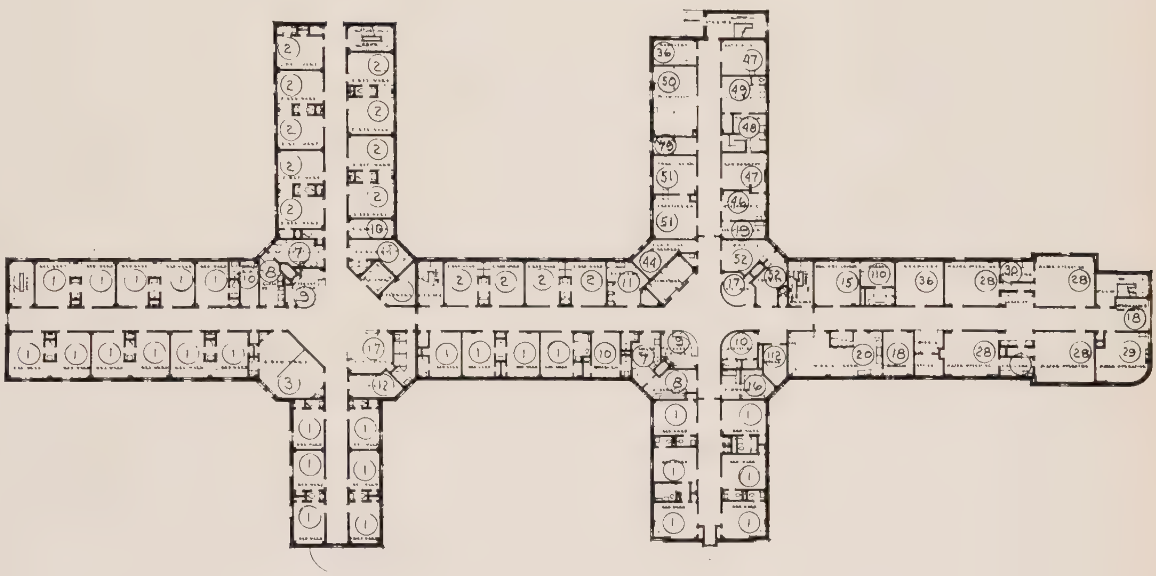
BASEMENT PLAN

1. One Bed Ward
2. Two Bed Ward
3. Four Bed Ward
4. Six Bed Ward
5. Nine Bed Ward
6. Twelve Bed Ward
7. Soiled Utility
8. Clean Utility
9. Nurses' Station
10. Nurses' Room
11. Servery
12. Linen
13. Solarium
14. Isolation Ward
15. Doctors' Room
16. Flowers
17. Visitors
18. Storage
19. Utility Room
20. Work Room
21. Lavatory
22. Service Room
23. Treatment Room
24. Balcony
25. Pack Room
26. Examination
27. Quiet Room
28. Major Operating Room
29. Minor Operating Room
30. Sterilizing
31. Equipment
32. Preparation
33. Emergency Operating
34. Anaesthetic
35. Surgical Dressing
36. Recovery Room
37. Delivery
38. Labour
39. Nursery
40. Premature Nursery
41. Mothers Instruction
42. Patients' Lounge
43. Fathers' Room
44. Charts
45. Students
46. Cystoscopic
47. Radiography
48. Dark Room
49. Gastric
50. Physiotherapy
51. Fracture Room
52. Tonsils
53. Refraction
54. Bio. Chem. Lab.
55. Fluoroscopic
56. Aspiration

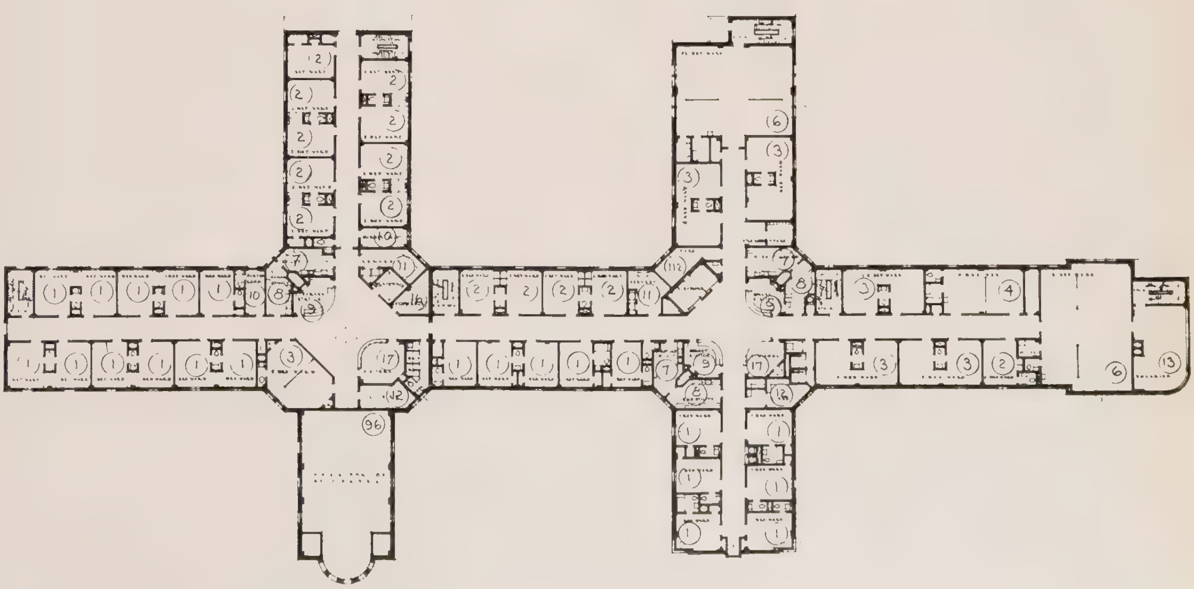
57. Hydrotherapy
58. Chemical Lab.
59. Pharmacy
60. Haemotology
61. Bacteriology
62. Urine Lab.
63. Central Supply
64. Dental Lab.
65. Eye and Ear
66. Formula Room
67. Plaster Casts
68. Dispensary
69. Morgue
70. Autopsy
71. Clinic
72. Dressing Room
73. Lobby
74. Admitting Room
75. Fitting Room
76. Brace Shop
77. Sewing Room
78. Crafts Room
79. Splints
80. Patients' Clothing
81. Lamp Room
82. Occupational Therapy
83. Gym
84. Library
85. Auditorium
86. Enquiry
87. Switchboard
88. Office
89. Secretary
90. Housekeeper
91. Matron
92. Superintendent
93. Dietician
94. Bursar
95. Post Office
96. Chapel
97. Dining Room
98. Cafeteria
99. Kitchen
100. Refrigerators
101. Laundry
102. Lunch Room
103. Refectory
104. Classroom
105. Common Room
106. Internes' Room
107. Bath
108. Living Room
109. Waiting Room
110. Locker Room
111. Laboratory
112. Unassigned



FOURTH FLOOR



THIRD FLOOR

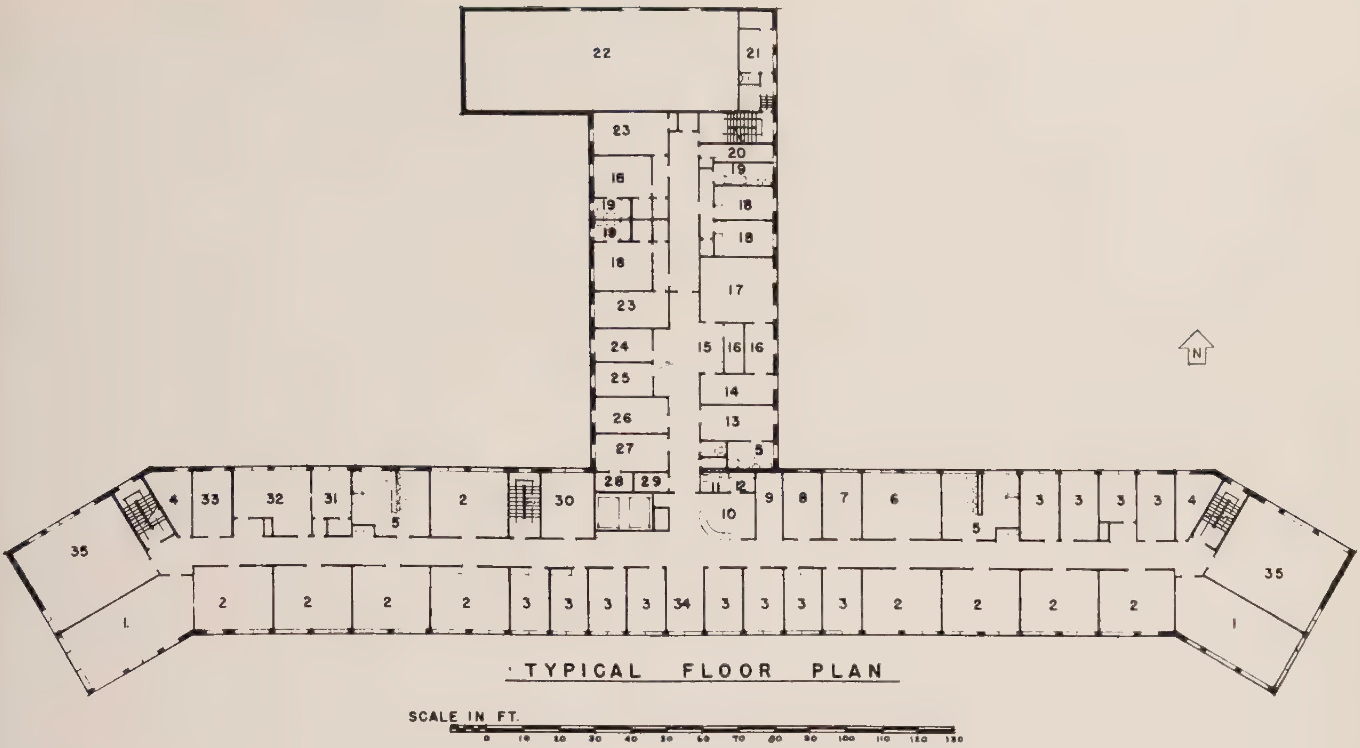


SECOND FLOOR

TUBERCULOSIS SANITORIUM, EDMONTON, ALBERTA

ARCHITECT'S OFFICE, PROVINCE OF ALBERTA, DEPARTMENT OF PUBLIC WORKS, EDMONTON, ALBERTA

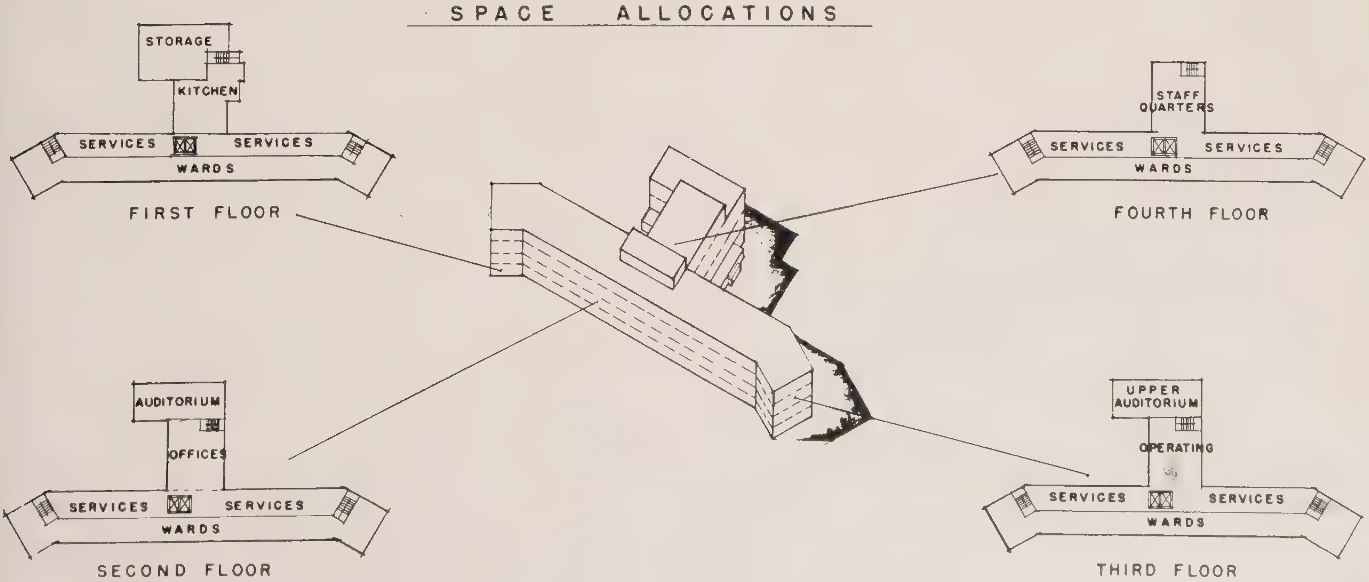
OFFICE OF W. L. SOMERVILLE, CONSULTING ARCHITECTS




TYPICAL FLOOR PLAN

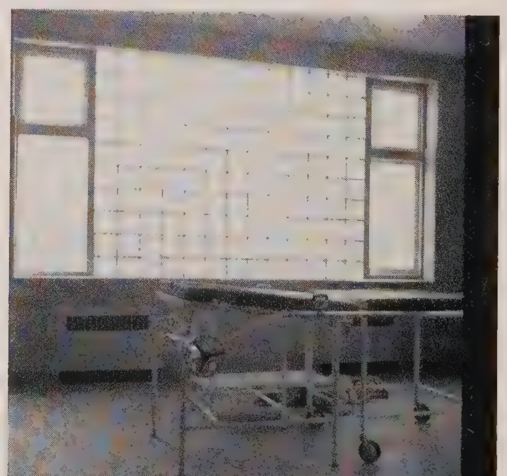
1. Solarium
2. 4-bed Ward
3. 2-bed Ward
4. Linen
5. Lavatory
6. Lamp Room
7. Patients' Utility
8. Clean Utility
9. Stretchers
10. Nurses' Station
11. Nurses' Station
12. Medicine
13. Doctors' Dressing Room
14. Nurses' Work Room
15. Scrub Up
16. Sterilizing
17. Operating Room
18. Bed Room
19. Bath Room
20. Kitchen
21. Projection Room
22. Upper Auditorium
23. Living Room
24. Aspiration
25. Fluoroscopic
26. Dressing Room
27. Dental
28. Dental Laboratory
29. Splints
30. Teachers' Room
31. Isolation Room
32. Sitting Room
33. Soiled Linen
34. Waiting Room
35. 9-bed Ward

SPACE ALLOCATIONS




# PONTIAC COMMUNITY HOSPITAL, SHAWVILLE, QUEBEC

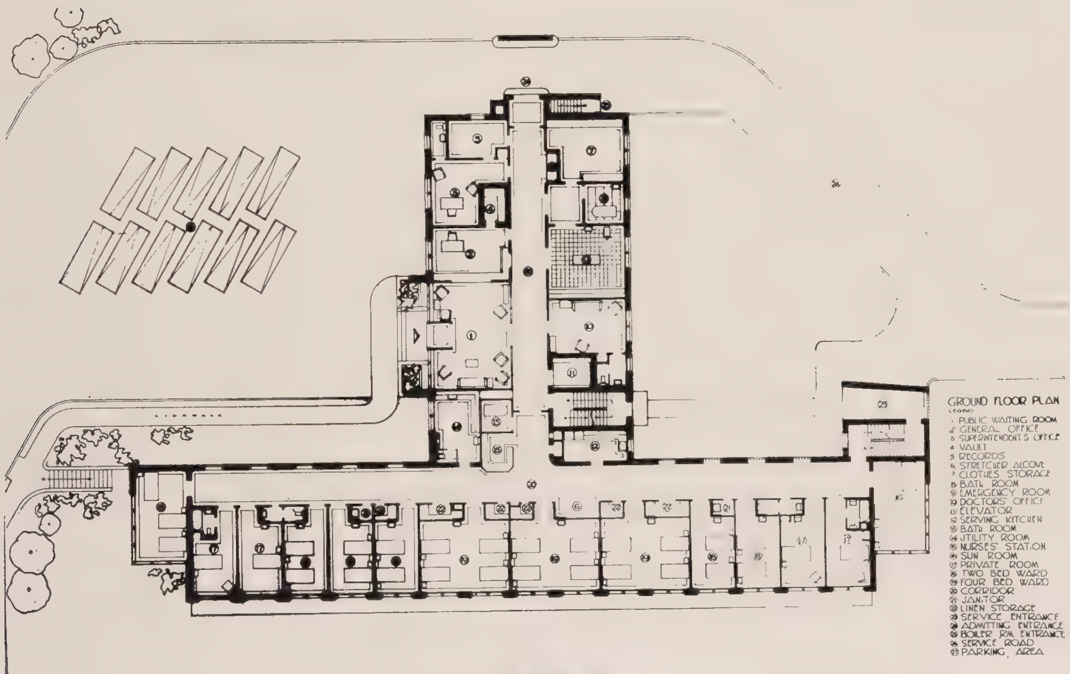
## ABRA, BALHARRIE AND SHORE, ARCHITECTS



FIRST FLOOR PLAN

LEGEND

1 ELEVATOR
2 DOCTORS' LOCKERS
3 SCRUB-UP
4 LABOUR ROOM
5 CASE ROOM
6 STERILIZERS
7 OPERATING ROOM
8 WORK ROOM
9 NURSERY
10 EXAMINATION ROOM
11 NURSERY DIET KITCHEN
12 SUSPECT NURSERY
13 ANESTHESIA
14 LINEN CHUTE
15 BATH ROOM
16 UTILITY ROOM
17 NURSES' STATION
18 SERVING KITCHEN
19 CORRIDOR
20 STRETCHER ALCOVE
21 SUN ROOM
22 PRIVATE ROOM
23 TWO BED WARD
24 FOUR BED WARD
25 JANITOR
26 LINEN STORAGE
27 PHARMACY JOIST



GROUND FLOOR PLAN

LEGEND

1 PUBLIC WAITING ROOM
2 GENERAL OFFICE
3 SUPERINTENDENT'S OFFICE
4 VAULT
5 RECORDS
6 STRETCHER ALCOVE
7 CLOTHES STORAGE
8 BATH ROOM
9 EMERGENCY ROOM
10 DOCTORS' OFFICE
11 ELEVATOR
12 SERVING KITCHEN
13 BATH ROOM
14 UTILITY ROOM
15 NURSES' STATION
16 SUN ROOM
17 PRIVATE ROOM
18 TWO BED WARD
19 FOUR BED WARD
20 CORRIDOR
21 JANITOR
22 LINEN STORAGE
23 SERVICE ENTRANCE
24 ADMITTING ENTRANCE
25 BOILER RM. ENTRANCE
26 SERVICE ROAD
27 PARKING AREA

BASEMENT FLOOR PLAN

LEGEND

1 ELEVATOR
2 LAUNDRY
3 ELECTRICAL ROOM
4 FUEL BUNKER
5 BOILER ROOM
6 FEMALE HELP LOCKER RM
7 MALE HELP LOCKER RM
8 STORAGE ROOM
9 SURGICAL SUPPLIES
10 NURSES LOCKER RM
11 MORGUE
12 CORRIDOR
13 DARK ROOM
14 PLASTER ROOM
15 X-RAY ROOM
16 DRESSING ROOM
17 WAITING ROOM
18 VIEWING ROOM
19 LABORATORY
20 PHARMACY
21 SUPERVISOR'S OFFICE
22 STAFF DINING ROOM
23 HELP DINING ROOM
24 KITCHEN
25 REFRIGERATOR
26 KITCHEN STORE RM
27 SOUTH ENTRANCE

SURGICAL 24 BEDS
MAXIMUM 27 BEDS

1 TOILET
2 BATH
3 SPECIAL NURSES
4 NURSES STATION
5 UTILITY
6 SERVERY
7 JANITOR
8 SUB UTILITY
9 FLOWER ROOM
10 SOLARIUM

OPERATING

14 MAJOR OPERATING ROOM
15 STERILIZING
16 SCRUB UP
17 MINOR OPERATING ROOM
18 NURSES
19 TOILET & SHOWER
20 DOCTORS
21 CHART ROOM
22 NURSES OFFICE
23 STERILE STORAGE
24 CLEAN UP
25 WORK ROOM
26 DUMBWAITER

SURGICAL 24 BEDS
MAXIMUM 27 BEDS

1 TOILET
2 BATH
3 SPECIAL NURSES
4 NURSES STATION
5 UTILITY
6 SERVERY
7 JANITOR
8 SUB UTILITY
9 FLOWER ROOM
10 SOLARIUM
11 LINEN CHUTE
12 STRETCHERS
13 STORAGE

SECOND FLOOR PLAN

ADMINISTRATION

1 TOILET
2 BATH
10 LOBBY
13 TELEPHONES
14 INFORMATION
15 GENERAL OFFICE
16 VAULT
17 ACCOUNTANT
18 RECORDS WORK ROOM
19 RECORDS
20 CHAPEL
21 TOILET & SHOWER
22 SPECIAL NURSES LOCKERS
23 SPECIAL NURSES
24 BOARD ROOM
25 INTERNE
26 OFFICE STAFF LOCKERS
27 CONSULTATION ROOM
28 SUPERINTENDANT OF NURSES
29 SUPERINTENDANT
30 DOCTORS
31 WAITING ROOM

X - RAY

32 PHYSIO-THERAPY
33 ELECTRO-THERAPY
34 WAITING ROOM
35 VIEWING ROOM
36 OFFICE
37 FILM STORAGE
38 DRESSING ROOM
39 CARDIO
40 DEEP THERAPY
41 CONTROL ROOM
42 GENERATOR SET
43 DIAGNOSTIC
44 DARK ROOM
45 DIAGNOSTIC
46 PLASTER ROOM
47 EMERGENCY ROOM
48 EMERGENCY WORK ROOM
49 STERILIZING
50 SCRUB-UP
51 LINEN & STORAGE
52 DUMBWAITER

MEDICAL 23 BEDS
MAXIMUM 26 BEDS

1 TOILET
2 BATH
3 SPECIAL NURSES
4 NURSES STATION
5 UTILITY
6 SERVERY
7 FLOWER ROOM
8 SUB UTILITY
9 JANITOR
10 LOBBY
11 LINEN CHUTE
12 STRETCHERS

FIRST FLOOR PLAN

KITCHEN

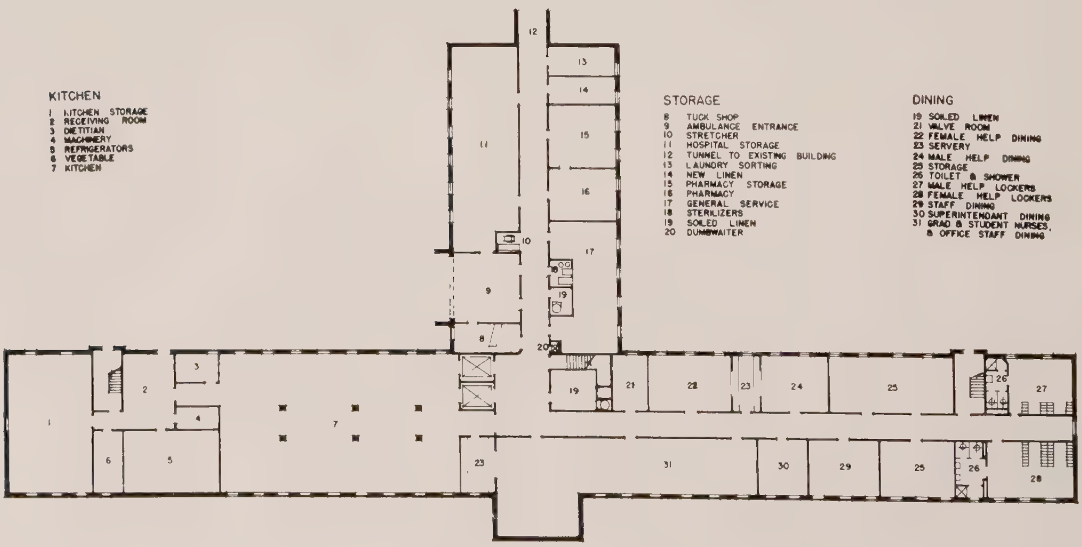
1 KITCHEN STORAGE
2 RECEIVING ROOM
3 DIETITIAN
4 MACHINERY
5 REFRIGERATORS
6 VEGETABLE
7 KITCHEN

STORAGE

8 TUCK SHOP
9 AMBULANCE ENTRANCE
10 STRETCHER
11 HOSPITAL STORAGE
12 TUNNEL TO EXISTING BUILDING
13 LAUNDRY SORTING
14 NEW LINEN
15 PHARMACY STORAGE
16 PHARMACY
17 GENERAL SERVICE
18 STERILIZERS
19 SOILED LINEN
20 DUMBWAITER

DINING

19 SOILED LINEN
21 VALVE ROOM
22 FEMALE HELP DINING
23 SERVERY
24 MALE HELP DINING
25 STORAGE
26 TOILET & SHOWER
27 MALE HELP LOCKERS
28 FEMALE HELP LOCKERS
29 STAFF DINING
30 SUPERINTENDANT DINING
31 GRAD & STUDENT NURSES, & OFFICE STAFF DINING

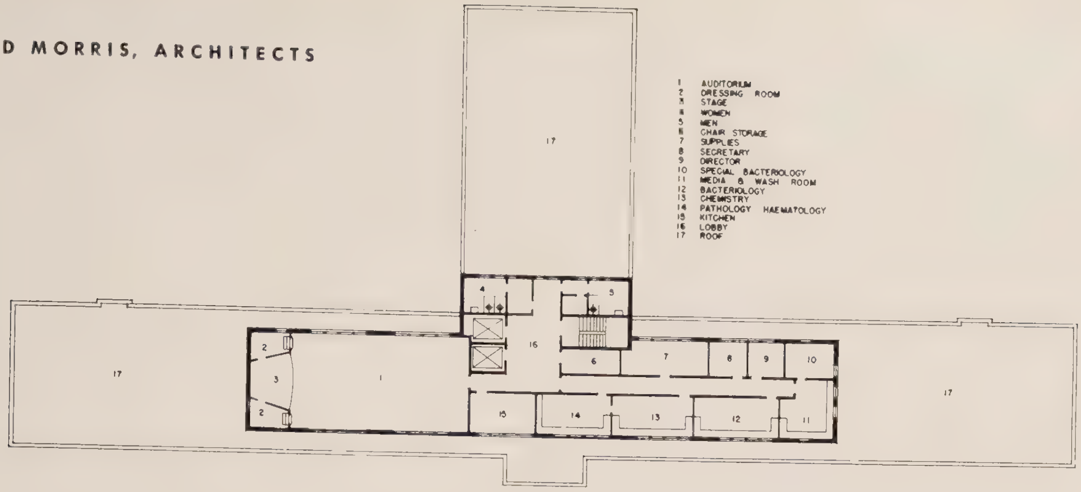


SCALE $\frac{1}{16}$" = 1'-0"

BASEMENT PLAN

# HOSPITAL, STRATFORD, ONTARIO

MARANI AND MORRIS, ARCHITECTS

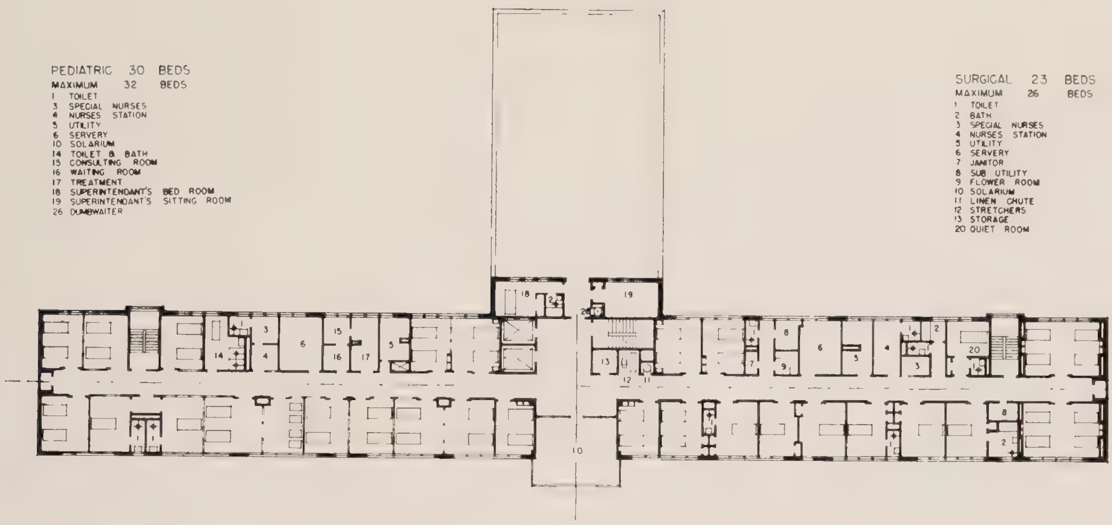


1 AUDITORIUM
2 DRESSING ROOM
3 STAGE
4 WOMEN
5 MEN
6 CHAIR STORAGE
7 SUPPLIES
8 SECRETARY
9 DIRECTOR
10 SPECIAL BACTERIOLOGY
11 MEDIA & WASH ROOM
12 BACTERIOLOGY
13 CHEMISTRY
14 PATHOLOGY HAEMATOLOGY
15 KITCHEN
16 LOBBY
17 ROOF

FIFTH FLOOR PLAN

PEDIATRIC 30 BEDS
MAXIMUM 32 BEDS
1 TOILET
3 SPECIAL NURSES
4 NURSES STATION
5 UTILITY
6 SERVERY
10 SOLARIUM
14 TOILET & BATH
15 CONSULTING ROOM
16 WAITING ROOM
17 TREATMENT
18 SUPERINTENDANT'S BED ROOM
19 SUPERINTENDANT'S SITTING ROOM
26 DUMBWAITER

SURGICAL 23 BEDS
MAXIMUM 26 BEDS
1 TOILET
2 BATH
3 SPECIAL NURSES
4 NURSES STATION
5 UTILITY
6 SERVERY
7 JANITOR
8 SUB UTILITY
9 FLOWER ROOM
10 SOLARIUM
11 LINEN CHUTE
12 STRETCHERS
13 STORAGE
20 QUIET ROOM



FOURTH FLOOR PLAN

MATERNITY 18 BEDS
17 CRIBS
1 TOILET
2 BATH
3 SPECIAL NURSES
4 NURSES STATION
5 UTILITY
6 SERVERY
7 JANITOR
8 SUB UTILITY
9 FLOWER ROOM
10 SOLARIUM
14 ISOLATION & CRIB
15 NURSERY
16 CHART ROOM
17 EXAMINATION & TREATMENT
18 FORMULA

DELIVERY
20 DELIVERY
21 STERILIZING
22 SCRUB UP
23 CLEAN UP
24 LABOUR
25 UTILITY
26 DOCTORS
27 SHOWER & TOILET
28 PREMATURE - [illegible] CRIBS
29 EXAMINATION & TREATMENT
30 CHART ROOM
31 NURSES STATION
32 NURSES LOCKERS
33 STERILE STORAGE
34 WORK ROOM
35 VISITORS ROOM
36 DUMBWAITER

MATERNITY 18 BEDS
17 CRIBS
1 TOILET
2 BATH
3 SPECIAL NURSES
4 NURSES STATION
5 UTILITY
6 SERVERY
7 JANITOR
8 SUB UTILITY
9 FLOWER ROOM
10 SOLARIUM
11 LINEN CHUTE
12 STRETCHERS
13 STORAGE
14 ISOLATION & CRIB
15 NURSERY
16 CHART ROOM
17 EXAMINATION & TREATMENT
19 DEMONSTRATION

THIRD FLOOR PLAN

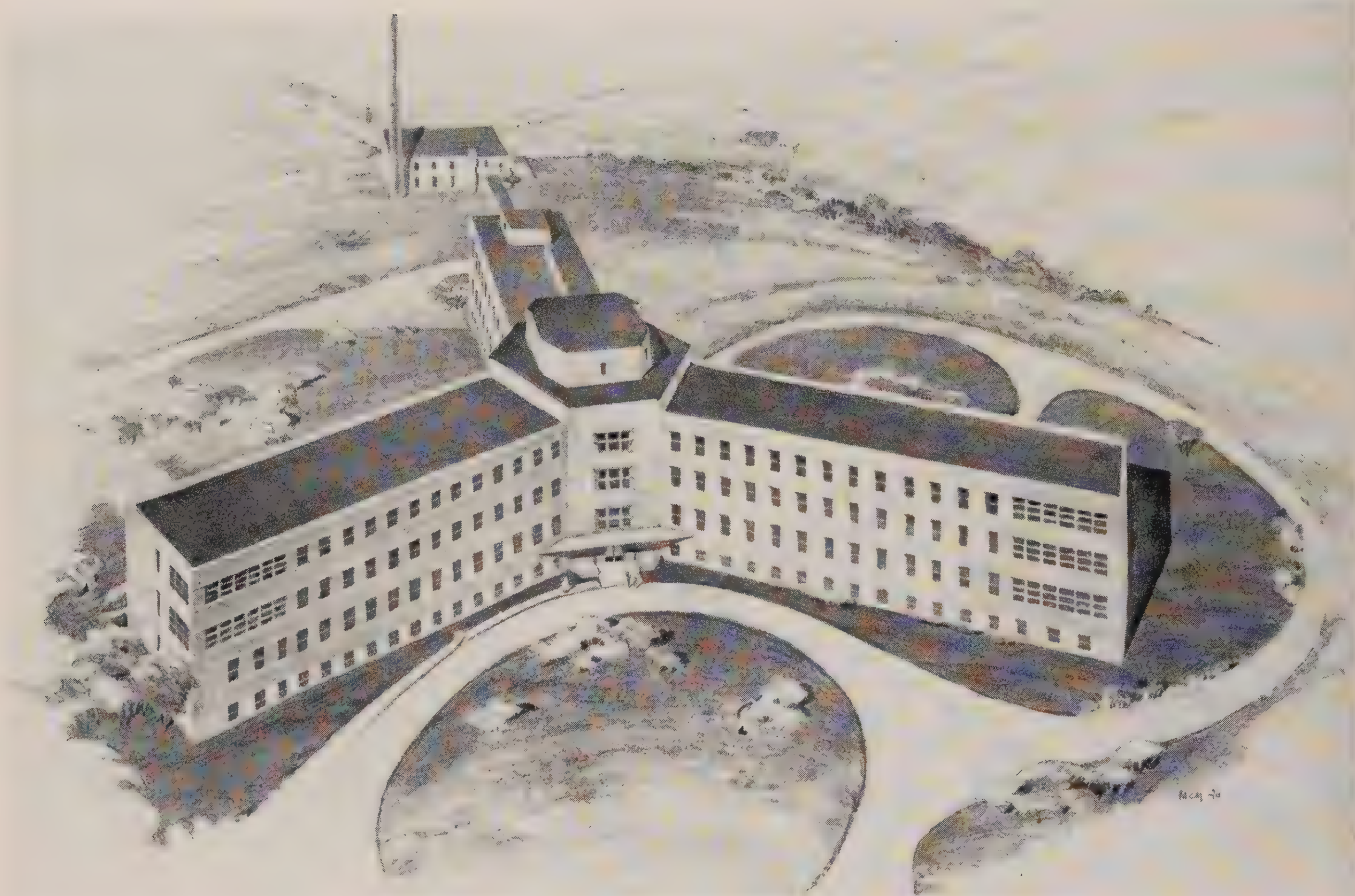
VICTORY WING, KINGSTON GENERAL HOSPITAL, KINGSTON, ONTARIO
DREVER AND SMITH, ARCHITECTS
HAROLD J. SMITH, CONSULTING ARCHITECT

TYPICAL CORRIDOR FROM NURSES' STATION

TYPICAL SERVERY

MINOR OPERATING ROOM TO CANCER CLINIC

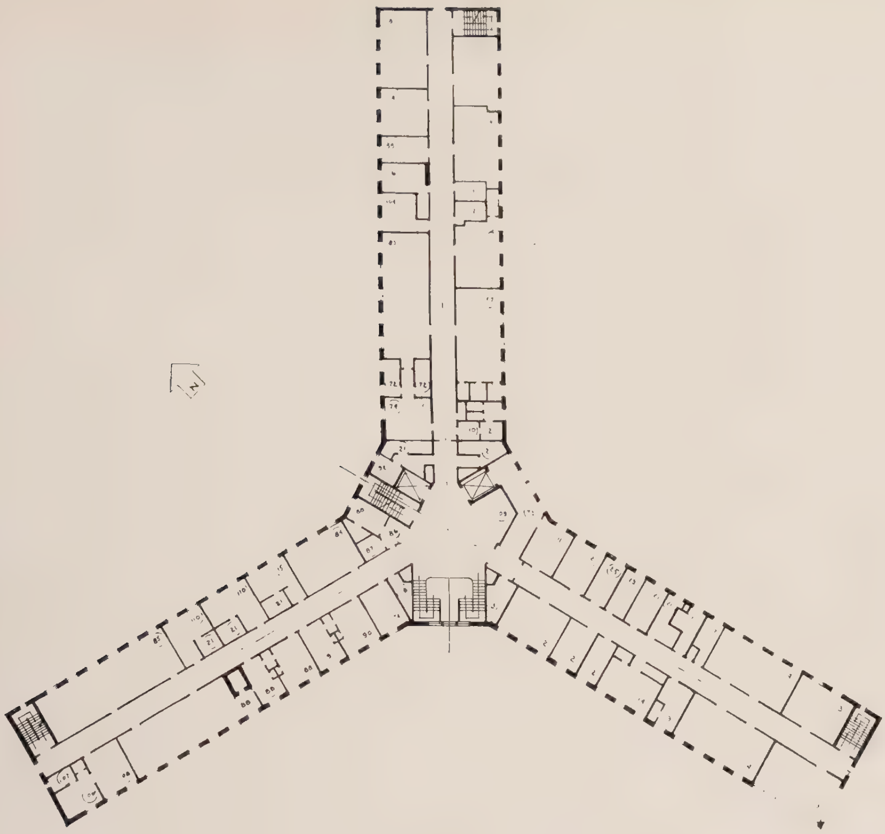
Photographs by Associated Screen News Limited



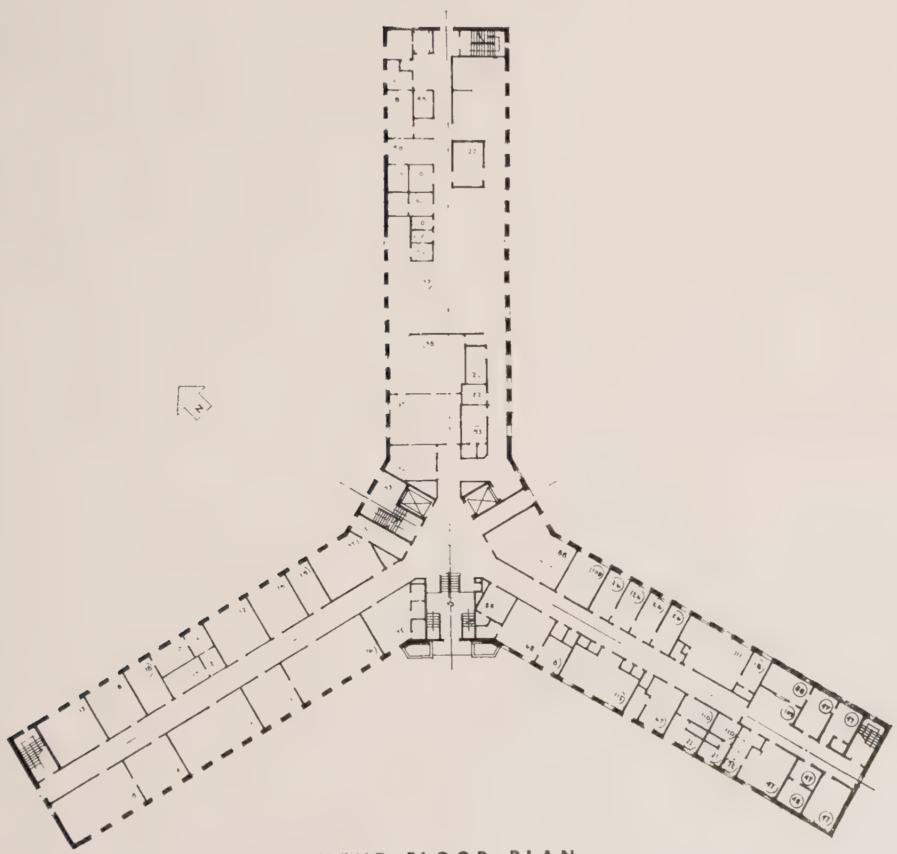
JUNIOR RED CROSS CRIPPLED CHILDREN'S HOSPITAL, CALGARY, ALBERTA

OFFICE OF W. L. SOMERVILLE, ARCHITECTS

J. M. STEVENSON, CAWSTON AND STEVENSON, ASSOCIATE ARCHITECTS



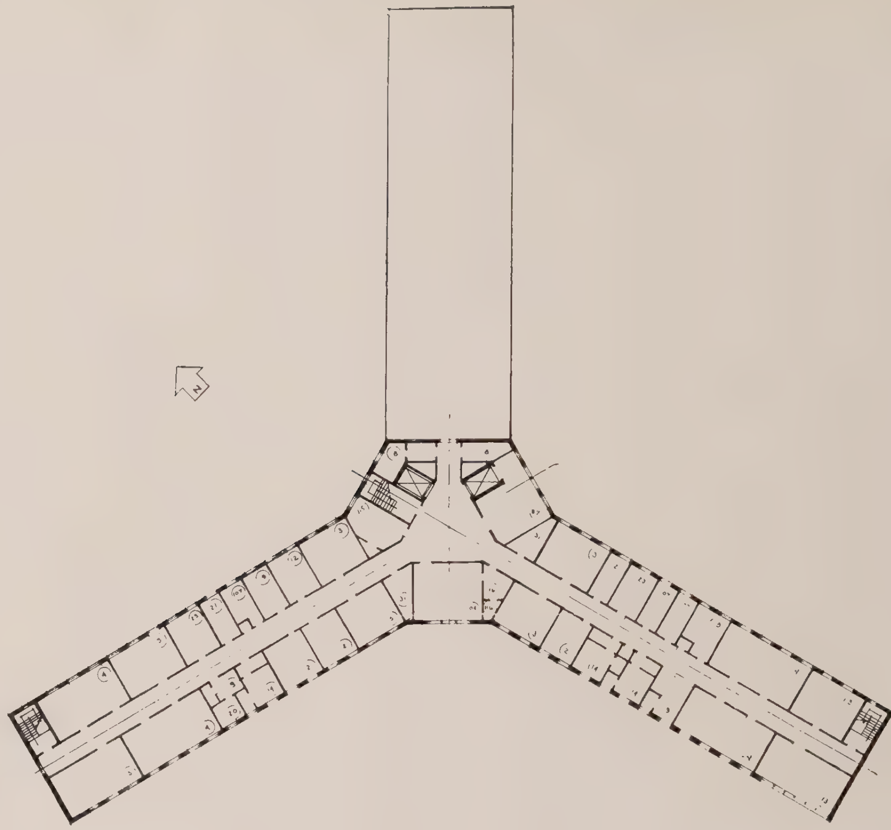
FIRST FLOOR PLAN



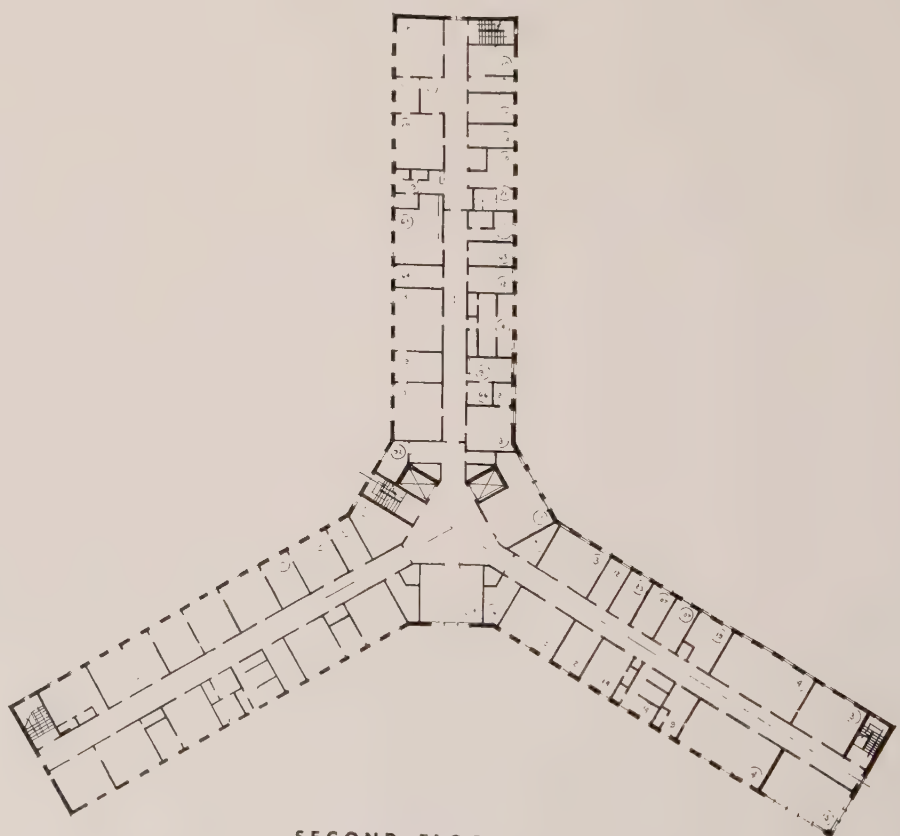
BASEMENT FLOOR PLAN

1. One Bed Ward
2. Two Bed Ward
3. Four Bed Ward
4. Six Bed Ward
5. Nine Bed Ward
6. Twelve Bed Ward
7. Soiled Utility
8. Clean Utility
9. Nurses' Station
10. Nurses' Room
11. Servery
12. Linen
13. Solarium
14. Isolation Ward
15. Doctors' Room
16. Flowers
17. Visitors
18. Storage
19. Utility Room
20. Work Room
21. Lavatory
22. Service Room
23. Treatment Room
24. Balcony
25. Pack Room
26. Examination
27. Quiet Room
28. Major Operating Room
29. Minor Operating Room
30. Sterilizing
31. Equipment
32. Preparation
33. Emergency Operating
34. Anaesthetic
35. Surgical Dressing
36. Recovery Room
37. Delivery
38. Labour
39. Nursery
40. Premature Nursery
41. Mothers Instruction
42. Patients' Lounge
43. Fathers' Room
44. Charts
45. Students
46. Cystoscopic
47. Radiography
48. Dark Room
49. Gastric
50. Physiotherapy
51. Fracture Room
52. Tonsils
53. Refraction
54. Bio. Chem. Lab.
55. Fluoroscopic
56. Aspiration
57. Hydrotherapy
58. Chemical Lab.

59. Pharmacy
60. Haemotology
61. Bacteriology
62. Urine Lab.
63. Central Supply
64. Dental Lab.
65. Eye and Ear
66. Formula Room
67. Plaster Casts
68. Dispensary
69. Morgue
70. Autopsy
71. Clinic
72. Dressing Room
73. Lobby
74. Admitting Room
75. Fitting Room
76. Brace Shop
77. Sewing Room
78. Crafts Room
79. Splints
80. Patients' Clothing
81. Lamp Room
82. Occupational Therapy
83. Gym
84. Library
85. Auditorium
86. Enquiry
87. Switchboard
88. Office
89. Secretary
90. Housekeeper
91. Matron
92. Superintendent
93. Dietician
94. Bursar
95. Post Office
96. Chapel
97. Dining Room
98. Cafeteria
99. Kitchen
100. Refrigerators
101. Laundry
102. Lunch Room
103. Refectory
104. Classroom
105. Common Room
106. Internes' Room
107. Bath
108. Living Room
109. Waiting Room
110. Locker Room
111. Laboratory
112. Unassigned
113. Stores
114. Paint Room
115. Play Room
116. Teacher



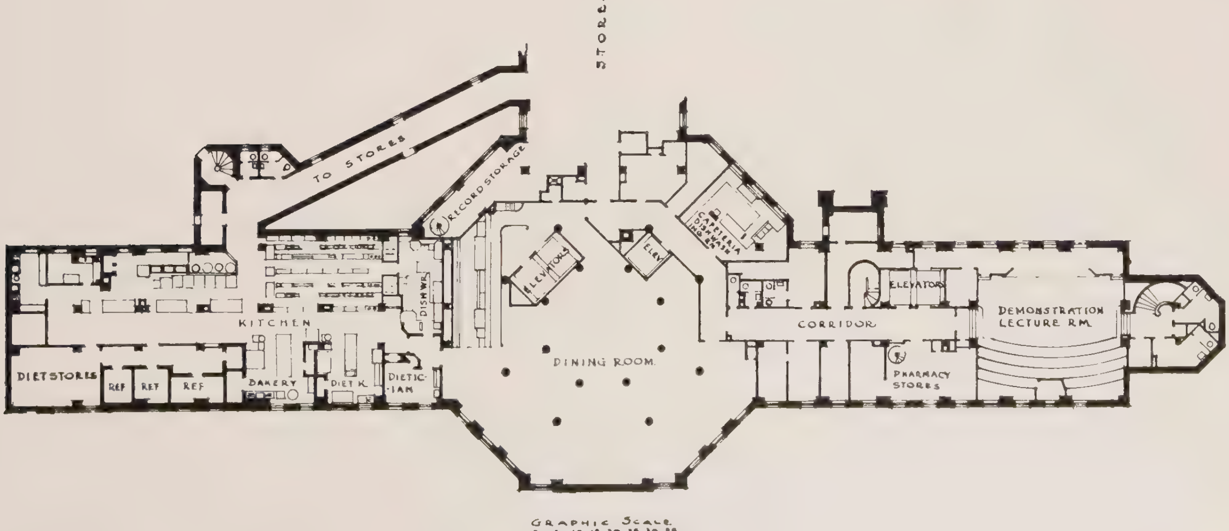
THIRD FLOOR PLAN



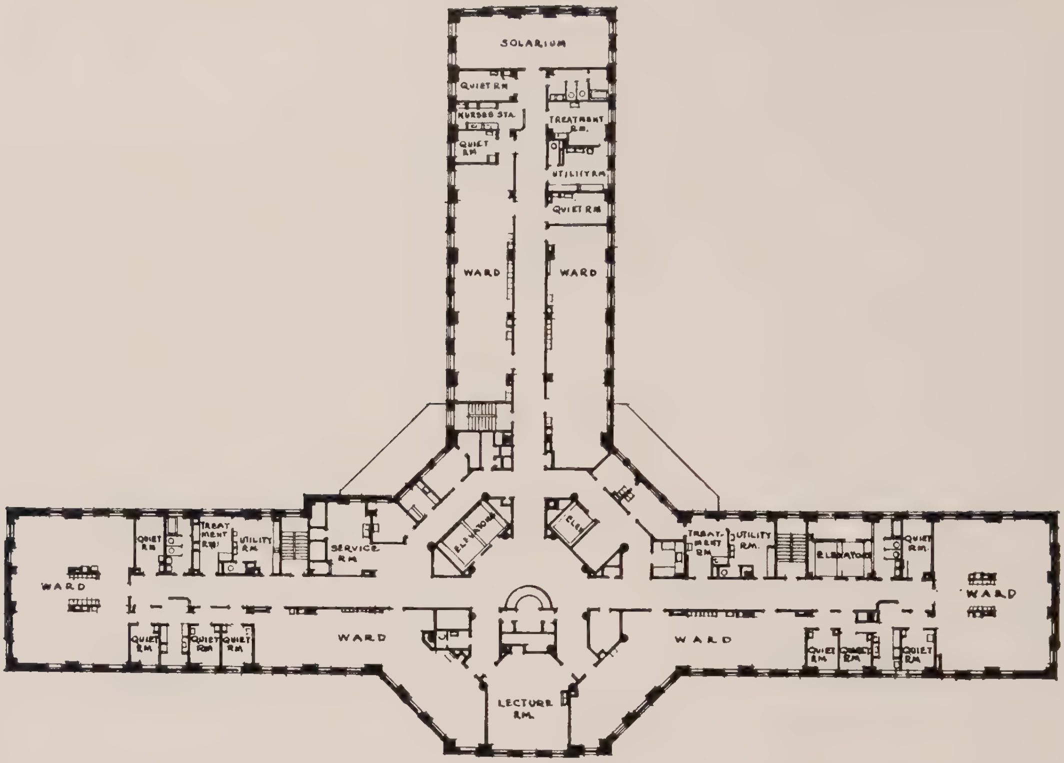
SECOND FLOOR PLAN

NEW VICTORIA GENERAL HOSPITAL, HALIFAX, NOVA SCOTIA

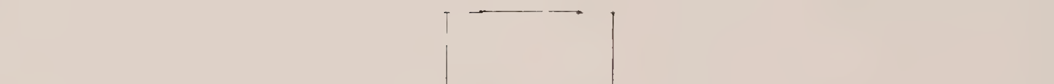
ANDREW R. COBB, ARCHITECT, WITH CLIFFORD ST. J. WILSON, ASSOCIATE



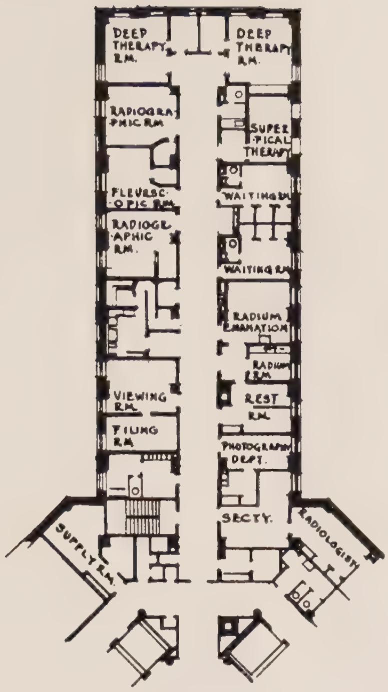

PLAN OF FIRST FLOOR




PLAN OF 4th, 5th AND 6th FLOORS

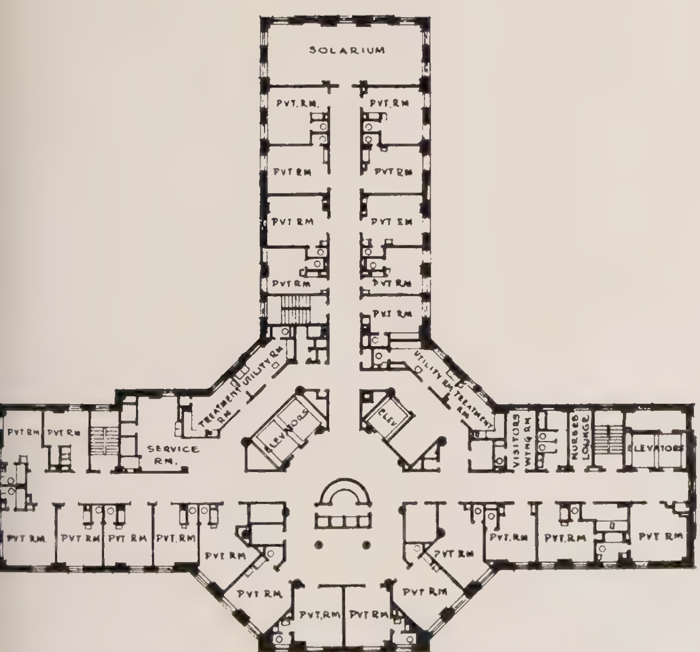



PLAN OF 7th AND 8th FLOORS

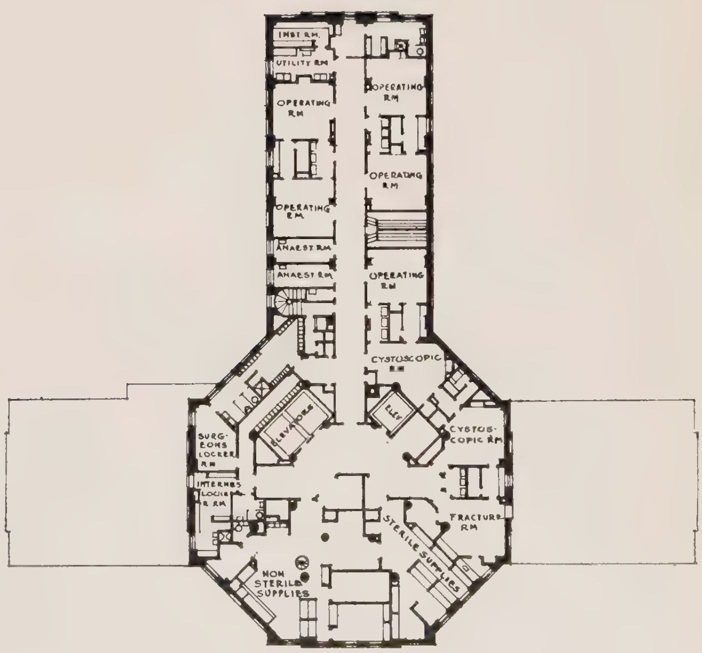



X-RAY DEPARTMENT

WEST WING THIRD FLOOR




PLAN OF 9th, 10th, & 11th FLOORS




PLAN OF 12th FLOOR

# RADIANT HEATING AND COOLING

By G. LORNE WIGGS, M.E.I.C., M.A.S.M.E., M.A.S.H.V.E., *Senior Partner*

WIGGS, WALFORD, FROST & LINDSAY

*Consulting Engineers* • Montreal, Toronto

## INTRODUCTION

Radiant heating is today one of the most widely discussed subjects among people interested in the design and construction of new buildings. In fact probably no innovation in the building industry within recent years has created such broad and diversified interest as that subject. Yet radiant heating remains a paradox to a great many people. Numerous others are still somewhat confused about the subject and are still not clear about its practical application in Canada. A great number consider that radiant heating is a very recent form of heating which is consequently as yet largely experimental and unproved. Yet radiant heating is not, as many people think, a new form of heating.

In its modern form it originally was conceived in England about forty years ago, where it is more generally known as "panel heating." It has been used in many buildings of all types throughout the world ever since. Due to the fact that the English inventors both patented the idea and held their technical data a closely guarded secret for years, radiant heating was not commonly used in Canada, nor in the United States, until recent years. The many advantages of radiant heating were such that a number of progressive engineers on this continent experimented with such systems, and gradually developed techniques for the design and installation of radiant heating systems. The use of radiant heating then gradually increased both in Canada and the United States. Today it is becoming an accepted requirement of most of the truly up-to-date buildings.

Unfortunately both in Canada and the United States there exists at present considerable confusion regarding radiant heating, except in the minds of those who have either followed the very successful English principles and practice, or who, by extensive study and research have now reached the same conclusions and follow similar methods as the English engineers. It was inevitable that a number of the early experimenters in Canada and the United States should develop their ideas along widely divergent lines, achieving the advantages of radiant heating in part only. There are thus today many radiant heating designers who, for practically all their installations, advocate the use of pipe coils embedded in the floor construction, regardless of the disadvantages of so placing the coils in most installations in this climate.

This article is based on the knowledge and experience of the writer and his associates gained from a long and extensive experience with radiant heating installations in Canada, from the technical data and advice received from Richard Crittall & Co., Ltd., of London, England, and from the technical data, private communications and personal assistance received from most of the outstanding American authorities on that form of heating.

It is the purpose of this article to define an ideal heating system, to cover briefly the fundamentals of radiant heating and cooling, to describe and illustrate the practical application of radiant heating in Canada, to show how the present-day radiant heating system compares with the ideal heating system, to give its disadvantages, and finally to deal with the effect of radiant heating and cooling installations on the design and construction of modern Canadian buildings.

In addition to the essential requirements of an ideal heating system, heating systems, particularly in residences, may be required to provide an economical means of heating the domestic hot water requirements throughout the entire year, and also a satisfactory means of automatically controlling that water temperature.

Another additional feature which it may have to provide, but which is not directly a heating function, is that

## ESSENTIAL REQUIREMENTS OF AN IDEAL HEATING SYSTEM

**1. *Comfort***

It should maintain the optimum comfort for the occupants of the building throughout the heating system, and should maintain a minimum temperature difference between the floor and ceiling of each room.

**2. *Capacity***

It should have adequate capacity to heat the entire building to the desired indoor temperature conditions at the lowest temperature encountered in the region in which the house is located and at the prevailing winter wind.

**3. *Flexibility***

It should be sufficiently flexible to maintain, when heating continuously, the desired indoor temperature conditions over the entire range of heat demand due to the extreme variations in outdoor temperature, wind velocity and sunshine that occur during the complete heating season.

**4. *Economy and Durability***

It should be economical in fuel consumption and in other operating costs. Its maintenance costs should be low. Its installed cost should be low, and it should not require any costly changes in the building construction. Its durability should be equal to that of the building in which it is installed.

**5. *Safety***

It should be safe in operation, and should not contribute to the fire hazard of the building.

**6. *Simplicity***

Its operation and upkeep should be simple.

**7. *Silence***

It should be silent in operation, and should not convey sound from one part of the building to another.

**8. *Cleanliness***

It should be clean in operation, and should not discolour or dirty any part of the building or its furnishings.

**9. *Appearance***

It should be as completely inconspicuous as possible.

**10. *Control***

It should be provided with a completely automatic control system.

the heating installation should contain a simple and inexpensive means of humidifying the building, without disturbing the air temperature at any point within that building.

### FUNDAMENTALS

One of the reasons that so much confusion exists regarding radiant heating is the fact that most people think of all heating in terms of convection heating, and they do not then understand how heat can be transmitted by radiation. It is beyond the scope of this article to go fully into the theory and all the fundamentals of radiant heating and cooling, but it is necessary to refer briefly to some of these in order to make the remainder of the article clear to the readers. As it is well known, heat may be transmitted by conduction, convection and by radiation.

*Conduction* is that process by which heat is transferred from any body to a body at a lower temperature which is brought into direct contact with it, or by which heat is transferred from one part of a body to another part of the same body which is at a lower temperature.

*Convection* is that process in which heat from a warm object by conduction heats the air in contact with it, and that air, becoming heated, expands and so becomes lighter, with the result that it rises and carries away the heat that it has taken from the warm object. When the air thus heated and circulated, comes in contact with a cooler body, it gives up some of its heat and becomes heavier, thus sinking and assisting the air movement already set up. Heat may also be transferred by convection by the circulation of air by mechanical means, or by some external force such as the wind.

*Radiation* is that process by which heat is transferred from a warm object to a cooler one by electromagnetic waves of energy which are transformed into heat when they are intercepted by the cooler object. These waves are similar to light rays, they travel at the same speed, and may be reflected or absorbed in the same manner. Radiant heat waves pass through the air without affecting its temperature, and are independent of the temperature and movement of the air. The heat from the sun reaches the earth entirely by radiation.

In practice, no warm object transfers heat to a cooler one entirely by convection or solely by radiation. For instance, warm air heating systems and steam or hot water systems having concealed convectors emit practically all of their heat output by convection. An exposed cast iron radiator gives off about 70% of its heat output by convection and 30% by radiation, while a radiant heating system utilizing pipe coils embedded in the ceiling dissipates about 72% by radiation, and 28% by convection. The figures for radiant heating systems having coils buried in the walls and buried in the floors are 59% and 52% by radiation respectively.

It has long been known that optimum comfort conditions in any enclosure are dependent among other things, not only on the mean air temperature within that enclosure and on its temperature gradient, but also on the average temperature of its ceiling, floor, wall and window surfaces. In practice, with either convection or radiant heating, the air temperature in most buildings is usually maintained between 65°F and 75°F, while the average temperature of the interior surfaces generally fall close to or within this same range of temperatures. It has been reported that the average surface temperature of the clothing and exposed surface of a normally clothed male is 81°F. It is obvious therefore, that the air temperature and the average temperature of the interior surfaces of heated rooms found in practice are such that the heating systems in buildings do not heat up their occupants. On the contrary, even in well heated rooms, there is a continuous loss of heat from the human body by convection to the air in the room, and by radiation to the walls, floor and ceiling of the room.

The real function of a heating system then is to maintain in a building such an air temperature and such an average surface temperature as will provide optimum comfort conditions for its occupants. The optimum conditions really vary with the sex, age, the amount of clothing and on the degree of activity of the occupants, but in practice conditions are usually designed to be best suited to the average occupant.

It has been established that in rooms in which the air velocity is low that the temperature of the air and average temperature of the interior surfaces exert approximately equal influence on the comfort of the occupants. That is, the same degree of comfort can be obtained in an enclosure by having a low air temperature and a high average surface temperature as can be maintained when these are just the reverse.

A conventional hot water or steam heating system, utilizing either exposed radiators or concealed convectors, imparts its heat directly to the air in the building in which it is installed and the air then warms up the interior surfaces of the building. The average temperature of the interior surfaces of the building are thus invariably lower than the average temperature of the room air. The colder it becomes outside, the greater is this difference. Besides this, in such systems is always an appreciable temperature gradient between the floor and ceiling. This temperature gradient is more pronounced in extremely cold weather than in moderate weather.

It has been definitely proved by experience that a room is more comfortable and healthier if the walls, ceiling and especially the floor are warmer than the air in the room; also that within the range of 65°F to 75°F for the same feeling of warmth, the lower the air temperature the greater will be the sensation of comfort.

A radiant heating system, utilizing pipe coils embedded in the ceiling construction and having hot water circulated through those coils, conducts its heat directly to the ceiling surfaces. These by the flow of radiant energy transmit heat directly to the occupants and to the floors and walls of the building, which then by convection warm the air in the building. With radiant heating systems then the inside air temperature is consequently lower than the average temperature of the interior surfaces. Because most of the inside air is heated by convection from the floor surfaces, it follows that the floor temperatures are invariably warmer than the inside air, but cooler than the ceilings from which they receive their heat. In radiant heated rooms the temperature gradient between the floor and ceiling is generally very small.

## RADIANT HEATING SYSTEMS DEFINED

A radiant heating system may be defined as a heating system which emits the greater part of its heat output by radiation. Radiant heating systems may be either of the high temperature type or of the low temperature type, depending on the temperature of the radiating surface. Low temperature radiant heating is generally considered to be one whose radiating surface does not exceed 130°F. Unless otherwise indicated, radiant heating systems are generally taken as, and are hereinafter assumed to be, low temperature systems.

*It may be taken axiomatically that the greater the percentage that the radiant heat output is of the total heat output, the greater will be the advantages of radiant heating over convection systems.*

## TYPES OF RADIANT HEATING SYSTEMS

Radiant heating may be accomplished by utilizing hot water, steam, warm air or electricity as the heating medium. They may utilize either pipe coils (or wires in the case of electric systems) embedded in the ceilings, walls or floors, or make use of special radiant units fastened either to the walls or ceilings. The great majority of the systems installed today are designed with hot water as their heating medium and with pipe coils buried in the ceiling, wall or floor surfaces. Systems with the coils embedded in the ceiling surfaces are consequently known as ceiling systems, and those with coils buried in the floors as floor systems.

## PRESENT DAY RADIANT HEATING PRACTICE

With the building construction now commonly used in Canada and with the climatic conditions that exist here, the best radiant heating installations are undoubtedly ceiling systems, except in a few applications where floor systems, either alone or in combination with ceiling systems are preferable. The pipe coils are usually made up of steel or wrought iron pipe or of brass or copper tubing in the form of sinuous coils. Fig. 1 shows copper coils in the ceiling of a small residence in Dorval.

These are fabricated of ⅜″ type L soft drawn copper tubing.

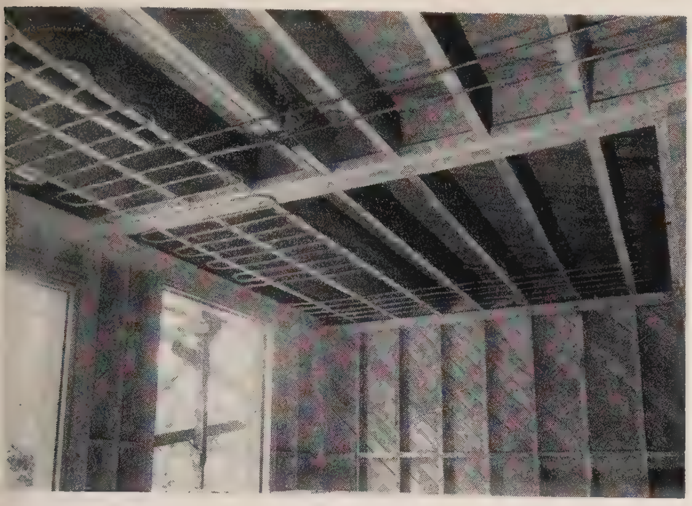


FIGURE 1

The pipe coils are usually, but not necessarily designed to run at right angles to the joists. Fig. 2 shows the installation of pre-fabricated ceiling coils, made up of ½″ standard black iron pipe, in a large residence in Montreal.

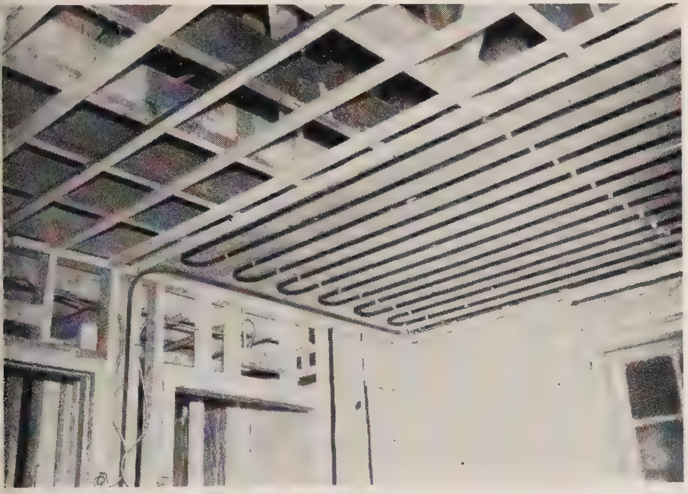


FIGURE 2

The pipe coils are connected by means of suitable flow and return mains, branches and risers either with a hot water heating boiler or with a steam heated converter. One or more pumps circulate the hot water through all parts of the system and a thermostatic control system is provided to control automatically the operation of the system. Frequently in large buildings it is usual to either divide the system into a number of different zones or to provide supplementary controls to allow for different use and occupancy and to regulate for different sun and wind effects. The control system should preferably be such that there is a continuous flow of water through the pipe coils at a variable temperature rather than intermittent flow at a constant temperature. The best control known today is that utilizing a water temperature controller in the flow main to the coils, which controller is reset or compensated by means of an outdoor thermostat. The temperature control system should be of the gradual acting or modulating type.

Taking a moderate sized house as a specific example, the radiant heating would consist of ceiling coils in the living room, dining room, kitchen, the bed rooms, and the halls. Floor coils would be installed in the garage (if heated) and in the basement. The vestibules and the bath rooms (if with tile floors) should utilize both floor and ceiling coils. Floor coils are used in the garage, the vestibules and in the bath rooms in order to keep their floors dry. Besides this, in bath rooms they are used so that the tiled floors will feel warm to bare feet.

FIGURE 3

Fig. 3 shows the exterior of the residence of Mr. R. E. Bolton, M.R.A.I.C. of Montreal, which is equipped with such a radiant system.

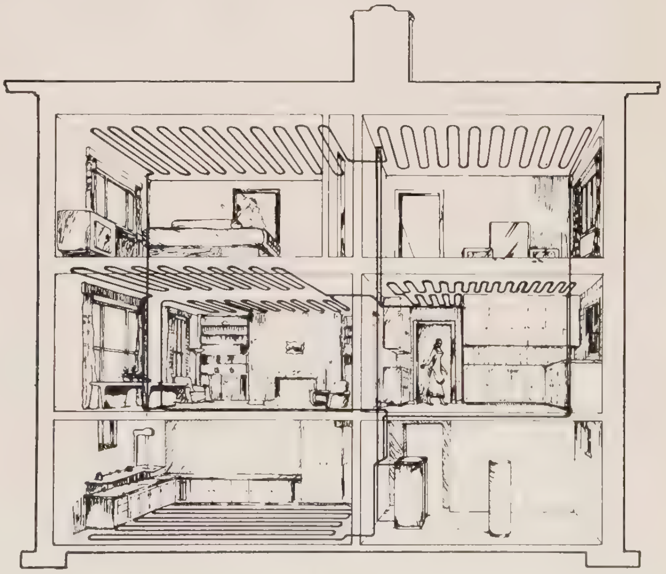


FIGURE 4

Fig. 4 illustrates the installation of the radiant heating in a sectional perspective of that house.

Fig. 5 shows a corner of the living room and the method of embedding the pipe coils in the ceiling. The pipes are fastened directly to the lower sides of the joists and the metallic lath is then wired to the pipe coils.

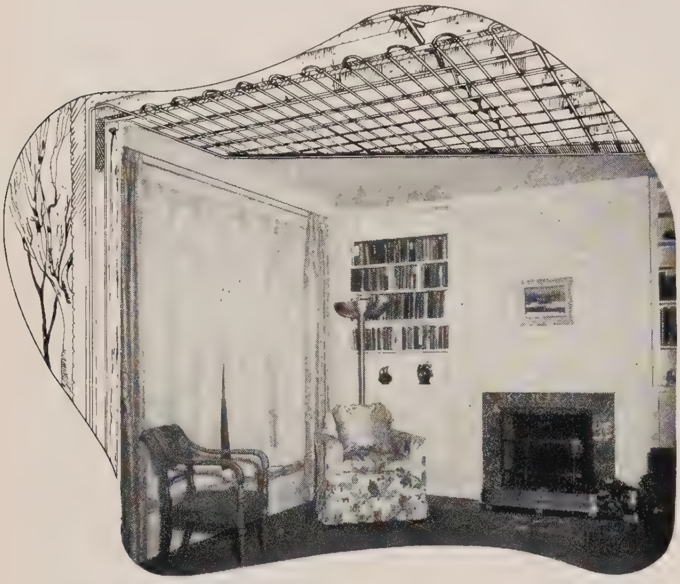


FIGURE 5

## RADIANT COOLING SYSTEMS

A radiant cooling system is similar to a radiant heating system, but a cooling unit is used in place of the heater required in a radiant heating system. In the case of radiant cooling systems, the pipe coils should preferably be embedded in the ceiling plaster, except in hospital operating rooms, when they should be built into the walls.

A radiant cooling system may be the sole means of cooling an enclosure, or it may be combined with a suitable dehumidifier or a conventional summer air conditioning system. The radiant cooling system may be utilized to do all or part of the sensible cooling, while the dehumidifier or the air conditioning system will cool and dehumidify both the air in the room and the fresh air supplied to it. This combination has many advantages over a straight summer air conditioning system, and would undoubtedly eliminate many of the faults of present day air conditioning installations. Unfortunately in such a paper as this, space does not permit of a fuller discussion of radiant cooling systems. It should not be left, however, without pointing out that combining radiant cooling with a conventional summer air conditioning system will provide more uniform room temperatures, a substantial reduction both in the size of the ductwork and of the air conditioning equipment, a reduction in the air circulated in the enclosure and will undoubtedly have a lower operating cost than ordinary summer air conditioning systems.

## RADIANT HEATING COMPARED WITH THE IDEAL

Let us consider how a modern, well designed and properly installed radiant heating system approaches the ideal. From the point of view of comfort it is undoubtedly true that radiant heating systems, especially those having the panels embedded in the ceiling, are more comfortable and much healthier than other forms of heating, due to the fact that the ceilings, walls, and especially the floors are warmer than the air in the room, and the temperature gradient between the air at the ceiling and that at the floor is very slight.

With regard to capacity, it has been proven by a large number of radiant heating installations that radiant heating systems can be designed to have adequate capacity to suit the Canadian climate and the ordinary building construction usually used in Canada.

From the point of view of flexibility, radiant heating systems, especially those utilizing pipe coils buried in the ceiling provide sufficient flexibility to offset the variations in outdoor temperatures and the wind velocities encountered in this climate. In general, the effect of the heat of the sun can be taken care of, but, in certain extreme conditions of window size to room size, the radiant heating system may not respond sufficiently rapidly to prevent some overheating during periods of intense sunshine. Radiant heating systems are not flexible enough to take care of sudden changes of internal heat in a building without special provision being made to take care of this. In churches, auditoriums, schools and in industrial plants, where large amounts of internal heat might suddenly be introduced into a room or enclosure, radiant heating systems, particularly floor type installations, are liable to become overheated or underheated depending whether a large amount of internal heat is added to the enclosure or suddenly removed from it. Thus radiant heating installations in this type of building require special consideration and treatment. It might be stated that even to meet these conditions provision can be made to maintain a reasonable comfort condition without great expense. It might be pointed out at this point that ceiling type installations respond much more quickly to changes in the water temperature than floor systems because the heat storage or thermal capacity of the average ceiling is only a small fraction of that of a floor, especially where the pipe coils are buried in a heavy concrete slab.

With regard to the economy of radiant heating, no authoritative figures have yet been published to show the comparison between the fuel consumption of radiant heated buildings and other buildings in Canada, but in England some forty years of experience has resulted in the English proponents of radiant heating claiming that such systems have a fuel economy exceeding 30% over that of other heating systems. It has been reported in Switzerland that radiant heating is being very commonly used because of its outstanding fuel economy. Experience in England and on the continent has demonstrated that maintenance costs are extremely low. The limited experience we have had in Canada bears this out, and also has proven that the other operating costs of radiant heating systems are extremely low.

Not sufficient radiant heating installations have been made in Canada to enable anyone to state definitely the relations between the cost of such installations and of other forms of heating. It is undoubtedly true that the cheapest forms of hot water, steam and warm air systems are cheaper than the radiant heating systems being designed today, but from the experience gained in the design of about fifty radiant heating systems it is the author's belief and experience that in the smaller homes a well designed radiant heating system is not more expensive than an equally satisfactory hot water or conditioned air heating system. It is also our experience that in industrial buildings and in large buildings of simple design, with either large open spaces or a large number of similar rooms, that well designed radiant heating systems can be installed at a lower cost than comparable steam or hot water heating systems. It might be mentioned that of course this comparison depends to a very great extent on the knowledge and experience of the designers of the radiant heating and to a lesser extent on the knowledge and experience of the contractor installing the same. Many instances have occurred where unqualified designers and inexperienced contractors installing radiant heating combined have resulted in the cost of the radiant heating being greatly in excess of any other form of heating. In the past, radiant heating systems have been designed which required substantial changes to the building construction, for which some of the sub-contractors asked ridiculously high prices. A study of the factors which caused this condition has resulted in improvements being made in the design of the radiant heating installations so that it may now be said that in general, radiant heating systems can be installed in buildings without requiring any costly changes in building construction.

From the safety point of view the radiant heating system is as safe, and probably safer than any other form of heating, and if anything, lessens the fire hazard of the buildings in which it is installed.

Based on the forty years experience in England and when some of their ideas are utilized, there is no doubt that radiant heating systems are as durable as the buildings in which they are installed. In fact according to our present knowledge and belief radiant heating systems will last indefinitely with the exception of course, of the boilers, circulating pumps and controls, but these items have as long a life as they would have in any other form of hot water heating.

The operation and upkeep of radiant heating systems are undoubtedly simpler than those of steam or warm air systems, and the equal of any other hot water heating system. They are absolutely silent in operation, and are less liable to convey sound from one part of the building to another than with any other form of heating. Radiant heating systems are, without doubt, cleaner in operation than any other form of heating, due to the fact that they are completely embedded in the building construction, and they do not cause convection currents which carry the dust around and dirty the walls and ceilings, such as is ever present with other forms of heating.

Radiant heating systems, being embedded in the building construction are completely inconspicuous, and they allow rooms heated by it to be designed with the architectural treatment or interior decoration desired without having to make any special provision for warm or return air registers, radiators, or concealed convectors, or for duct or pipe chases. Radiant heating can be provided with almost any kind of thermostatic control that the architect, owner or the heating designer may desire, but the control system must be designed with a careful consideration of the inherent characteristics of radiant heating systems.

With regard to the domestic hot water heating, this may be taken care of in radiant heated buildings as easily and as inexpensively as with either steam or other hot water heating systems.

The fact that room air temperatures can be, and usually are, lower with radiant heating systems than with convection systems, in buildings without humidifiers the relative humidity of the air is considerably higher than what it would be with convection heating systems. Due to the fact that lower air temperatures are maintained with radiant heating than with convection heating, the heat loss due to infiltration and to ventilation is greatly reduced.

A further great advantage of radiant heating is that it acts to offset the cooling effect of windows, particularly large ones. A window, while acting as an opening through which light enters, is one of the greatest sources of heat loss from a room. Radiant heating makes it possible to compensate directly for the heat losses from the windows; they can be carried down to the floor, and there is no heating equipment to interfere with full-length draperies.

Those not familiar with the experience on closed hot water heating systems frequently bring up the question of the possibility of corrosion of the pipe coils buried in the building construction, especially in the concrete slabs. It has been found by years of experience with all types of hot water heating systems that practically no corrosion takes place in such systems. This is due to the fact that when the system is first filled with water the corrosive elements in the water cause a slight corrosion and these elements are used up, so that no further corrosion then takes place. Furthermore, radiant heating systems are operated at temperatures which are sufficiently low to prevent the release of the semi-bound gases in the water which would prove actively corrosive. Any possibility of external corrosion of the pipes can be neglected as long as no cinders are used as a base for the concrete in which they are embedded.

Radiant heating is eminently satisfactory for the modern basementless house, which had been out of the question in this climate up until the advent of radiant heating. In such construction, by embedding radiant

heating pipe coils either in the ceiling or floor surfaces, cold damp floors are entirely eliminated. Fig. 6 illustrates such a house constructed in St. Hilaire, Que., in 1946, and designed by Morin & Cinq Mars, Architects.

FIGURE 6

Radiant heating systems are ideally suited for the heating of hospitals, sanitoriums, convalescent homes and schools where the control of dust is important in minimizing the spread of airborne disease or contagion and where the ventilation load may represent a high percentage of the total heating load. This is due to the fact that radiant heating can maintain comfortable, healthy temperatures and reasonable relative humidities in such buildings without the convectional circulation of air carrying dust (and so probably airborne bacteria) and without the existence of inaccessible dust-collecting surfaces in such systems. They can do this with lower room air temperatures and consequently effect very substantial fuel savings in such buildings, due to the reduced infiltration and ventilation losses. The number of exceptionally large installations of this type of building in England, and on the Continent bear this out.

FIGURE 7

Fig. 7 shows a picture of the new Civic Hospital in Basle, Switzerland, which is one of the largest radiant heated buildings in the world.

Radiant heating systems may be designed so that they can be embedded in driveways or walks so as to keep these clear of snow in winter. Fig. 8 illustrates the residence of Mr. and Mrs. W. A. Landry, designed by Mr. H. Ross Wiggs, A.R.C.A., A.R.I.B.A., equipped with a radiant heating system and with a snow melting system in the driveway to the garage. Fig. 9 shows the snow melting system before the concrete driveway was paved. This installation is filled with ethylene glycol solution and the heat is turned on only when snow falls.

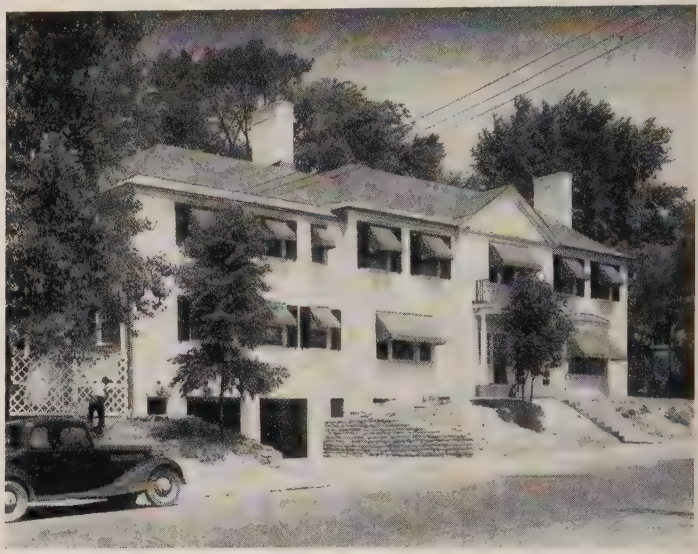


FIGURE 8

FIGURE 9

## DISADVANTAGES OF RADIANT HEATING

Fibreboard acoustic materials cannot be used with ceiling type radiant heating because these are efficient heat insulators. The use of suitable acoustical plasters which have almost equivalent sound absorbing properties eliminate this disadvantage.

Embedded portions of the heating system are difficult to alter and repair. Ceiling type panels are difficult, but not impossible to alter or repair. In most buildings structural alterations are infrequent, and by the use of suitable materials, good workmanship, careful testing and inspection experience has proved that there is no reason to anticipate need for repairs.

A further disadvantage of radiant heating which is frequently quoted is the time lag in the response of a

radiant heating system to variations in heat demand. Where pipe coils are embedded in heavy concrete floors it is inevitable that there will be a pronounced time lag in the response of the heating surface to the changes in the temperature of the water in the pipe coils and this has given rise to the fallacious belief that all radiant heating systems have this disadvantage. As a matter of fact, by embedding the pipe coils in the ceiling plaster the thermal capacity is reduced to the point where the time lag is a fraction of what it is with a heavy concrete floor and with suitable controls the time lag is no more serious than with other forms of hot water heating.

Many of the modern buildings constructed with large windows and equipped with radiant heating systems, particularly those of the floor type, are frequently overheated on sunny days and this is sometimes reported to be due to the time lag of the radiant heating system. The overheating is due, of course, to the intense heat of the sun penetrating the windows and being reradiated inside the rooms in which the sun falls. While the overheat may be more with radiant heating systems, it is very little more than with other forms of heating, and may be offset by opening the windows.

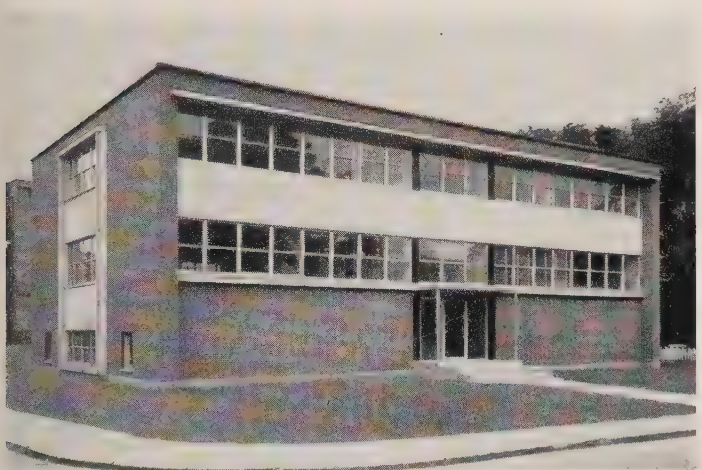


FIGURE 10

Fig. 10 is a view of the radiant heated New Head Office Building of the Angus Robertson Co. Ltd., Montreal, designed by Fetherstonhaugh, Durnford, Bolton & Chadwick, Architects.

## EFFECT ON BUILDING CONSTRUCTION

If ceiling type radiant heating systems are to be installed in a building constructed with wood or steel floor joists, the pipe coils are secured to the bottoms of the joists, metallic lath is then wired to the pipe coils and the metallic lath is then plastered. This has the effect of lowering the finished plaster less than one inch. Since the pipe coils usually do not cover the entire ceiling the portion without coils must be furred down and may utilize a fibre or gypsum board plaster base instead of metallic lath. In the intermediate floors it is good practice, but not essential to install a layer of insulation directly over the ceiling coils so as to direct the bulk of the heat downward. On the top floor the ceiling coils must be well insulated so as to prevent an excessive heat loss to the roof.

In reinforced concrete construction if the ceilings are either clipped or furred down the pipe coils are suspended from the concrete slabs and the metallic lath then wired to the pipe coils. If the ceilings are neither clipped nor furred down the pipe coils are placed in the bottoms of the forms so that they come as close as possible to the finished ceiling surface.

With ceiling type radiant heating systems the windows may be very large and they may be run close to or right down to the finished floor. The only exception to this is found in the case of small rooms having two or three exposed walls.

With our present knowledge radiant heating of the ceiling type requires that the pipe coils be embedded either in plaster, in cement or in concrete. The plaster must not be a heat insulator, such as vermiculite plaster, but may be one of a number of acoustic plasters which are not insulators. Recently a Norwegian engineer invented a radiant heated ceiling system which eliminates the use of plaster, cement or concrete. It is a ceiling of very small heat storage capacity, it appears to be an efficient source of radiant heat and it is known to be a highly efficient acoustic treatment. It appears to be especially suited for radiant heating (and cooling) of office buildings, schools and hospitals, where both radiant heating and acoustic treatment are highly desirable. At the time of writing this article the author and his associates are setting up a special research installation on this system in order to test its performance both for radiant heating and for radiant cooling. The results of this research may prove to be of great value and will be looked forward to with great interest.

If, as, and when the heat pump is developed practically to utilize the heat either from the earth or from atomic sources, radiant heating will probably be the means by which that heat is utilized to provide comfort in our buildings in winter. The same heat pump with the pipe coils connected to the cold side may then be used to cool the same building in summer.

## CONCLUSION

Ceiling type radiant heating has now reached the stage where it has been widely adopted in Canada, in addition to other parts of the world, and it has been proved without doubt that radiant heating systems of the ceiling type approach the ideal heating system closer than any other heating system so far developed. Radiant heating and cooling systems will doubtless be adopted much more extensively in the future than they are at present and it is likely that with the rapid development of the heat pump and with other scientific progress that radiant heating and cooling will become much more universal than even the present trend would seem to indicate.

# ROYAL ARCHITECTURAL INSTITUTE OF CANADA

## OFFICERS

PRESIDENT . . . . . . A. J. HAZELGROVE (F)

FIRST VICE-PRESIDENT . . . . MURRAY BROWN (F)

SECOND VICE-PRESIDENT . . . . H. H. G. MOODY

HONORARY SECRETARY . . . JAS. H. CRAIG (F)

HONORARY TREASURER . . J. ROXBURGH SMITH (F)

PAST-PRESIDENT . . . . . . . CHAS. DAVID (F)

SECRETARY . . . . . . . . MISS ANNE CORY

1323 Bay Street, Toronto

## COUNCIL

JOHN S. PORTER, JOS. F. WATSON, HENRY WHITTAKER . . . . . . . . . British Columbia

PETER L. RULE, G. K. WYNN . . . . . . . . . . . . . . . . . Alberta

W. G. VAN EGMOND (F), JOHN C. WEBSTER . . . . . . . . . . . . . Saskatchewan

H. H. G. MOODY, J. A. RUSSELL, ERIC THRIFT . . . . . . . . . . . . . Manitoba

Ontario

VICTOR J. BLACKWELL (F), MURRAY BROWN (F), JAS. H. CRAIG (F), A. J. HAZELGROVE (F), D. E. KERTLAND, R. S. MORRIS (F), FORSEY PAGE (F), W. BRUCE RIDDELL (F), HARLAND STEELE (F),

Quebec

OSCAR BEAULE (F), R. E. BOSTROM (F), EUGENE LAROSE (F), HAROLD LAWSON (F), J. C. MEADOWCROFT, A. J. C. PAINE (F), MAURICE PAYETTE (F), J. ROXBURGH SMITH (F)

J. L. FEENEY, H. CLAIRE MOTT (F) . . . . . . . . . . . . . . New Brunswick

LESLIE R. FAIRN (F), A. E. PRIEST . . . . . . . . . . . . . . . . Nova Scotia

## EDITORIAL BOARD REPRESENTATIVES

British Columbia: F. S. LASSERRE, Chairman; R. A. D. BERWICK, WILLIAM FREDK. GARDINER (F), PETER THORNTON, JOHN WADE

Alberta: C. S. BURGESS (F), Chairman; M. C. DEWAR, PETER L. RULE

Saskatchewan: H. K. BLACK, Chairman; F. J. MARTIN, DAN H. STOCK, JOHN C. WEBSTER

Manitoba: J. A. RUSSELL, Chairman; H. H. G. MOODY, ERIC THRIFT

Ontario: JAS. A. MURRAY, Chairman; WATSON BALHARRIE, L. Y. McINTOSH, ALVIN R. PRACK, HARRY P. SMITH, J. B. SUTTON, A. B. SCOTT, PETER TILLMANN

Quebec: RICHARD E. BOLTON, Chairman; O. BEAULE (F), JOHN BLAND, P. H. LAPOINTE, HAROLD LAWSON (F), J. CAMPBELL MERRETT, PIERRE MORENCY, LUCIEN PARENT (F), J. ROXBURGH SMITH (F), E. J. TURCOTTE

New Brunswick: H. CLAIRE MOTT (F), Chairman; W. W. ALWARD, J. K. GILLIES, D. JONSSON

Nova Scotia: LESLIE R. FAIRN (F), Chairman; ALLAN DUFFUS, A. E. PRIEST, J. H. WHITFORD

INCORPORATED BY THE DOMINION PARLIAMENT 16th JUNE, 1908, 1st APRIL, 1912, AND 14th JUNE, 1929

# NEWS FROM THE INSTITUTE

### XIVTH OLYMPIAD

The Institute wishes to extend most sincere congratulations to the firm of Marani and Morris of Toronto, on their splendid showing in the recent XIVth Olympiad Art Exhibition in London. The firm entered their Grandstand at the Canadian National Exhibition in the Architectural Division of the Art Exhibition, and forwarded a plot plan, an architectural model and a brief description of the grandstand for the competition. Notification has been received that this entry has been awarded an Honourable Mention by the panel of judges, and in a letter to the Institute, the Art Director of the XIVth Olympiad reported that the model had caused many favourable comments and had been greatly admired by the many visitors to the Exhibition.

### INTERNATIONAL COMPETITION

The Imperial Ethiopian Government has opened an International Competition for the Imperial Palace in Addis Ababa, in which Architects and Engineers of all nationalities holding Higher Technical School diplomas are entitled to compete. The total amount of the prizes is fixed as follows:

| | | |
|---|---|---|
| First Prize | e$25,000.00 | ($10,000), |
| Second Prize | e$15,000.00 | ($6,000), |
| Third Prize | e$10,000.00 | ($4,000). |

The Specifications Booklet, containing all the information concerning this competition, is on hand at the Institute office, and any interested members may obtain full details upon application to the Secretary.

The closing date of the competition will be December 30th, 1948, and all projects must be consigned to the Under-Secretary of State, Department of External Affairs, Ottawa, for transmission to Addis Ababa.

### AMENDMENTS TO MEMBERSHIP LIST

All members have now received a copy of the Membership list of the R.A.I.C. for 1948. For your information, the following amendments have been made since the publication of the list:

*Changes of Address*

Alberta—Stanley, K. C., 10029 Jasper Avenue, Edmonton. Stanley, R. M., 10029 Jasper Avenue, Edmonton.

British Columbia—Sandbrook, K. J., 70 Eighth St., Ste. 9, New Westminster.

Manitoba—Moody, H. H. G., 295 Broadway Avenue, Winnipeg. Moore, R. E., 295 Broadway Avenue, Winnipeg.

Ontario—Dudley, J. E. (Assoc. Member), 588 Gottingen Street, Halifax, N.S. Albrechtsen, Oluf, 834 Yonge Street, Toronto. Mills, A. K., 84 Carling Avenue, Apt., 1, Ottawa. Moore, R. E., 295 Broadway Avenue, Winnipeg, Man. Murray, Jas. A., 22 Harbord Street, Toronto. Winter, R., Mississauga Road, R.R. 2, Port Credit.

Quebec—Spence, D. Jerome, 1448A Mountain Street, Montreal.

### DECEASED

Quebec—Amos, Louis A. (F), F.R.I.B.A., M.E.I.C.

### NEW MEMBERS

Alberta—Minsos, A. O., 300 Birks Building, Edmonton.

British Columbia—Curtis, Harper, P.O. Box 62, Victoria. Ekins, W. D., 3-809 Denman Street, Vancouver. MacDonald, F. H., 201 Kresge Building, Edmonton, Alberta. Polson, F. M., 500-520 Granville Street, Vancouver.

Students: Burton, W. F., 1318 Ivy Place, Victoria. Carlberg, J. E., 615 W. Hastings Street, Vancouver. Cockrell, G. A., 626 W. Pender Street, Vancouver. Morton, A. C., Rm. 7, McCulloch Block, Nelson. Whiteley, W. E., Dept. of Public Works, Victoria.

Ontario—Candy, Kenneth H., Apt. 2A, 444 Walmer Road, Toronto. Coran, Harold J., 1010 St. Catherine St. W., Montreal, P.Q. Lambert, Martin, 102 Cambridge St., Ottawa.

Quebec—Wren, E. L., 20 Claremont Avenue, Pointe-Claire.

### ALBERTA

A certain fresh surge of interest in town planning has stirred the City Council of Edmonton. The advisability of having a man of training and experience in charge of the physical development of the city has been borne in on them from a variety of considerations. The question however arises; where can such skill be obtained? There is as yet no full systematic training in town planning in Canada. There is no institute of town planning and there are very few town planners. The suggestion has been made that a young man should be employed to learn the job by doing it. In default of teachers this is the natural solution. To learn in this way is excellent training but is liable to be got at the expense of a number of mistakes some of which may be serious or even irretrievable.

In the U.S.A. there are many town planners operating under various titles, such as Planning Engineers, Civic Landscape Architects or the like. For the most part these follow a fairly standardized system or method of procedure which has proved of good service. Its weakness is probably that it tends to be a routine and is apt to overlook special opportunities arising from the individual characteristics of cities or of their citizens. It is,

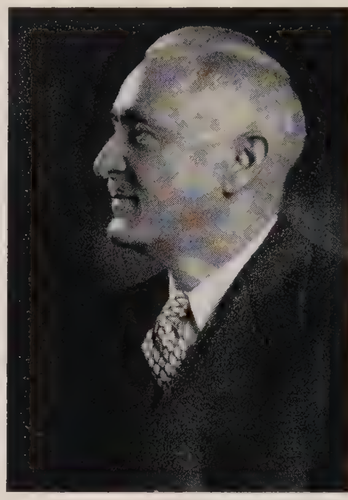
however, a generally applicable system which can hardly fail to be of benefit when well applied.

In Britain the approach is very different. The ravages of war imperatively demanded serious attention to the subject. An immense government machinery has been set up and put in motion towards creating better civic conditions throughout the land. Universities have established full qualifying courses in town planning. Town Planning Institutes are well established and publish Journals which maintain interest at a high level. The R.I.B.A. has played a very active and efficient part in stirring up interest and in giving general direction to the movement. The July issue of its *Journal* was largely occupied by statements by cabinet ministers and by heads of important departments all giving evidence of intimate interest in the subject. All seem to realize fully that no application of hard and fast rules will meet the whole case. The subject of housing among others undergoes careful analysis. It is found that a certain proportion of one, two, three, four, or five-bedroom houses is required in one community whilst in another quite a different proportion is demanded. When, as in that country, large housing schemes are being built and managed by municipalities it is highly important to provide the proper proportion. No crude generalities can be accepted as guides.

Architects are playing an important part in the work and they too are learning some lessons. Formerly they were strongly inclined towards terrace houses as being economic to build and as lending themselves to architectural design. On sloping sites however terrace houses are found to be by no means easy to handle architecturally and in consequence the economy becomes negligible. Experience with the operation of terrace houses shows that when an end house becomes vacant the intermediate tenants hasten to apply for it. The small individual house for which there is always a large demand does not lend itself well to the large architectural schemes. It is, however, capable of being absorbed into landscape effects of various sorts. Architects will be well advised to recognise this. There are other arts besides architecture. A somewhat amusing case is mentioned as occurring in Belgian West Africa, where authorities laid out a town for natives divided into equal rectangular lots with which each occupant could do what he pleased. All planted trees which grew so rapidly that the town quickly resembled a fairly dense jungle concealing a multitude of kralls in which the natives live a somewhat insanitary but happy life not far removed to all appearance from the scenes of their earlier days.

In the articles referred to one finds a number of interesting observations. The countryman likes enclosure in contrast to his outdoor working life. Wide vistas from windows are not to his taste. He finds too that his garden grows better vegetables when enclosed and that not by hedges but by brick walls on which fruit will ripen well. The windows of his house should face east and west with a good blank south wall for a large pear tree and a north wall to keep out the cold. The future promises to be rather full of old folks and it is found that whilst these like to have a little place of their own they mix very readily and happily with the very young and like to see them at play. These and other observations indicate a realistic and hopeful attitude. Zoning implies segregation but must not be carried too far. Industries must have their place but within easy reach of the workers' houses. People properly mix with their own sort but must not become so far separated as to forget one anothers existence. We are all interdependent and are, or ought to be, of interest to one another.

*Cecil S. Burgess*



*Photograph by J. Kennedy*

H. H. MADILL

**Professor H. H. Madill** has been appointed director of the School of Architecture at the University of Toronto. After 58 years as a department of the Faculty of Engineering, the School begins this academic year as a separate division. "The new school will have greater freedom in the design of its curriculum," said the new director. "It will have greater scope in integrating those courses which are peculiarly architectural with courses in engineering and in the humanities."

## CONTRIBUTORS TO THIS ISSUE

### Nathaniel A. Owings

Partner in the architect-engineer firm of Skidmore, Owings & Merrill, with principal offices in New York, Chicago, and San Francisco. He served as Development Supervisor of Chicago's 1933 Century of Progress Exposition, and was an active participant in his firm's planning and building during the war of the town of Oak Ridge, Tennessee, birthplace of the atom bomb. The firm's practice, on an international scale, puts emphasis on public and semi-public projects, including numerous hospitals. Firm is now making a master plan to enlarge and convert Oak Ridge into a permanent city. It is engaged also, as associate architects, in planning the United Nations' Headquarters in New York; is building a town in Venezuela for 30,000, and one in Sumatra, for personnel and families of oil companies. Mr. Owings is Chairman of the Chicago plan Commission He is 45; was graduated from Cornell University College of Architecture in 1927.

**Hon. Reginald Percy Vivian, M.D.**

Educated at Barrie Public School, Collegiate Institute and the University of Toronto. Graduated in Medicine, 1926.

Postgraduate study at Henry Ford Hospital, Detroit. Medical Officer, Essex Scottish, 1927-1929.

Practised medicine in Akron, Ohio, until the early thirties, when he purchased a practice in Port Hope, Ontario, and returned there to live.

Physician, Trinity College School, Port Hope, 1936-1943.

Elected to Ontario Legislature, 1943.

Appointed Minister of Health and Public Welfare.

Re-elected to Provincial Legislature, June, 1945.

Resigned as Minister of Health and Public Welfare, 1945, but retained his seat in the Legislature until June, 1948. Did not stand for re-election.

Appointed Chairman, Department of Health and Social Medicine, McGill University, Montreal, September, 1945.

**G. Lorne Wiggs**

Was born in the City of Quebec, and graduated from McGill University in 1921. Entered private practice as a Consulting Engineer in 1929, and built up a practice, which reached from one side of Canada to the other during the last world war. Shortly after entering private practice he designed what was probably the first radiant heating installations in Canada. Early in 1948 he took three of his former senior engineer employees into partnership with him, forming the consulting engineering firm of Wiggs, Walford, Frost and Lindsay. Recently the firm established an office in Toronto. Mr. Wiggs has been responsible for the electrical and mechanical equipment for an imposing list of large residences, apartment houses, office buildings, industrial plants, hospitals, theatres, and other recreational buildings. He has long been recognized as an authority on air conditioning and on radiant heating.

Mr. Wiggs is a member of the Engineering Institute of Canada, the Corporation of Professional Engineers of Quebec, the American Society of Mechanical Engineers and the American Society of Heating and Ventilating Engineers. He was for some time President of the Montreal Chapter of the last mentioned Society, and also served as a member of the Council of the same Society. At present he is a member of the Technical Advisory Committee on Radiant Heating of the A.S.H.V.E.

He is an author of numerous papers that have been presented to various technical organizations, and that have been published in the technical press both in Canada and in the United States.

## BOOK REVIEW

### THE WORSHIP OF GEARS

**Mechanization takes Command; a Contribution to Anonymous History, by Siegfried Giedion.**

**Published by Oxford University Press, Toronto, 1948. xiv plus 743 pages. Price $13.00.**

It remained for a man from Switzerland, home of superb mechanical skill, to uncover the sources of that mechanical power upon which is so largely based the present pre-eminence of the United States in world affairs. Siegfried Giedion's new book is a valiant addition to our consciousness of our own period. In *Space, Time and Architecture* (Harvard, 1941) the same author recounted a sorry tally of divorce very close to home: how Western man has become more ingenious in what he builds, yet more dubious in the over-all emotional effect of his product. This unhappy split 'between our modes of thought and our modes of feeling' he sees being healed by some contemporary architects and artists; they try both to exploit the stubborn material stuff of the new technology and to respond sensitively to the aesthetic appetites it whets. Giedion would speed this reconciliation of utilitarian purpose with direct sensory fitness — of *commoditie* with *delight* — by some detective work in our back-kitchen history while the rift was developing. In *Mechanization Takes Command* he retraces in detail some of the ways in which all clockwork and no sense-play has made Jack's life dull.

He comes up with a great many clues: the book weighs several pounds and includes over 500 illustrations ranging from Greek vase details to new items from the Sears-Roebuck catalog. But most of the plates are from the records of the United States Patent Office. The accompanying testimony also comes from a world of witnesses: Juan Miro, T. S. Eliot, Alexander Calder and James Joyce rub shoulders in the box with railway presidents, butchers, schoolmasters, safe-crackers and a host of assorted inventors. The presiding investigator amply displays the universality of interest he so much admires in the pre-mechanized eras, and which he sees reviving a little in the mid-twentieth century. He looks at the modern Atlantic community undergoing a total process, much as Heinrich Woelfflin (his compatriot and teacher) looked at the Baroque and Rococo world in *Principles of Art History*. Both authors take much of their comprehensive approach from their fellow-countryman of a century ago, Jacob Burckhardt; he showed the value of wide-angle vision to an understanding of the classical world and especially of *The Civilization of the Renaissance in Italy*.

The present book, like those earlier ones, is put together upon almost symphonic scaffolding. Unlike the scheme in most histories of man-made things, they are here grouped by basic purpose rather than by surface treatment; that is, the inventions for a particular function are followed through their periods of prime use and modification, it may be from Minoa to Santa Monica. The

cumulative development of usefulness is thus more easily seen than it is where a mixed bag of chattels is thrown together through a series of hysterical 'styles.' Giedion opens with a word on his scheme, and subsequent main sections are given to: the mechanization of repetitive handcraft motions (with Yale's tumbler lock as an example); the development of the assembly line (whose roots go a century back of Henry Ford); the mechanization of processes involving organic matter (grain harvesting, bread-making, slaughtering, stock-breeding); and finally the impact of the machine on human comforts (on the porch or train, in the salon, kitchen or bath). Readers of the *Journal* may have seen some of these sections in recent issues of *The Architectural Review* (London). At the end are some tantalizing suggestions for the salvation of mankind from mechanization-for-mechanization's-sake.

As to historical findings, Giedion is quick to disclaim comprehensiveness for this work. Most of his ground will have to be re-examined with greater thoroughness by specialists; the political economist, the sociologist, the patent attorney, the historian of engineering *(rara avis)*, even the nutritionist may find much detail to revise. But someone had to be the single-handed pioneer; he enters a Dark Continent of history where are buried the forbears of the machines that shape our world — from cradles to graves. And the reader must marvel at how one man could map so much new territory. The reader may also hope that the experts who follow Giedion will be gifted with his sharp eye for the human significance of what they find. For this explorer is not out merely to fill his pockets with little-known facts, fascinating as they are. Rather, he exhibits mechanisms for what they reveal of the sensibilities of their users. In his approach to this problem of human values lies the kernel of Giedion's contribution. He is not content merely to catalog such things as the stages in the Decline and Fall of the Common or Garden Hammock — although he often had to discover such steps since no-one else had done so. Giedion sees significance in *why* one device after another was shelved on its invention, only to prove irresistibly attractive to some later generation. He admits the good practical reasons for such lags — like shortage of manpower and accumulation of capital in nineteenth century America, or the intervening arrival of such a key device as the small electric motor. But he insists that these alone are not sufficient to explain the lapses and surges seen in the use of many simple mechanical devices. This mechanism or that is suddenly adopted and exploited, or as suddenly abandoned; over and above the orthodox economic reasons, says Giedion, there are sometimes compelling *psychic* ones. If those psychic compulsions can be identified and brought into consciousness, as this reviewer understands the argument, then it will be easier to bridge the tragic gulf that stands between our intellectual and aesthetic modes of behavior. For the use we make of mechanizations pervades both spheres.

The argument is a complex one to develop, and not one to which any short review can do justice. It is fraught with difficult questions as to the technics familiar to those who at any time are in control of the instruments of production; there are even more questions as to the aesthetic standards and ideals shared by those same people. In the past century and a half their very identity in the Western World has shifted constantly, sometimes radically. Knowledge and taste that were *arriviste* in the controlling groups intrude upon the discussion of their motives, and make the whole task of analysis of social compulsions very sticky indeed.

Giedion sorts out these annoying factors by the same means he has used before: somewhat arbitrarily, at times, he divides historic facts into 'transitory' and 'constituent' groups. (Thus the Victorians' love of machine-made ornament was 'transitory' but their growing skill in the use of iron and glass structure was 'constituent.' Generally their attempts to reproduce the symbols and trappings of earlier non-mechanized epochs were doomed to be transitory.) This grouping helps the author's case; incidentally, it serves to distil out of the nineteenth century's vast building experience the elements significant to twentieth century architects.

But the case grows complicated: Giedion runs not only an inquiry into the reasons why we mechanize, but on top of it a defence of mechanization itself against false charges — such as causing the corruption of ornament or the woes of the itinerant farm worker. (Both were well begun before the inception of mechanization on any scale.) He is sometimes loath to sacrifice any detail of a machine's pedigree, as where he eliminates the possibility that Linus Yale got his lock idea from the Ancients. These side-trips might be objectionable, were it not that, as in Mozart, the passage with the least obvious relationship to the main theme often contains the most telling insights given. (An example is the fifteen-page passage on "Napoleon and the Devaluation of Symbols" etc.) Giedion is greatly taken with coincidences of time — as between simultaneous and similar approaches to an industrial problem in Chicago and to a speculative one in Vienna or Paris. But he disarms his critics by filling seeming discursions chock-full of pregnant hints and observations that hold the reader while they justify themselves.

The author must be given great credit for the courage shown in tackling his problem, and for the energy with which he marshals his discoveries and contrives methods to analyze them. At the very least we owe him gratitude for voluminous information collected in a field so obvious that few investigators have given it a second glance. Further, he has provided a preliminary measure of the insidious adulteration of our human standards — governing the bread and meat on our tables, the buildings we design, the music we hear, the pictures we admire, the way we use leisure. That adulteration we tend to ignore in our preoccupation with the rites of the cult of Mechanization.

It appears (pages 708-11) that architecture has partly withstood the blandishments of Mechanization simply by being a generation or two behind the procession of wheat-mining, baking, slaughtering, carriage-making, plumbing and gadgeteering of other sorts. (How very close we came, though, with that officially-blest Canadian post-war house of metal! It had two gigantic piano-hinges in the main floor, permanently installed at the buyer's expense so that the maker's truck could get through any underpass that might intervene between factory and site.) Of such designs, and they are still with us, Giedion says: "It is too late for us still to be cheated by purely engineering solutions won at the expense of human comfort . . . The task of mechanization is not to deliver ready-made, stamped-out houses or mechanical cores, but flexible, standardized elements admitting of various constellations, so as to create better and more comfortable dwellings." To this, Amen.

Giedion's study exposes in what ways mechanization as a human agent may be used to untold advantage, but is often abused at our peril. He has pointed a way towards the dynamic balancing of our uneven thrusts at material and immaterial well-being. But such counterpoise of itself seems unlikely to usher in a new Renaissance: it will not be that simple. Quite a bit of socially decisive conduct does not seem to be directed to human well-being of any sort. That problem is left by Giedion to others; yet it all has to do with the pursuits that predominate society and with the agents enlisted in those pursuits — such as mechanization.

*Alan H. Armstrong*

☆ ☆

When the Board decided to do an issue on Store Fronts in August, **Mr. Earle Morgan's** name obviously came to mind as he had specialized in that kind of work for some time. Readers of the *Journal* will have had an opportunity to study the August issue, which we think does Mr. Morgan credit. The Editorial Board extends its thanks to him for the trouble he took in its preparation.

## OBITUARY

### WILLIAM FORD HOWLAND

It was my privilege to be the partner of such a man as Ford Howland: one of such outstanding frankness, ability, and simplicity of motive could only go with a fine person. I was so well aware of his worth through our long period of forty years' practice together. The only break in this was his military service in the first Great War. He was a Major in the Canadian Forces, and spent a considerable time in Western Canada, finishing up in Siberia. He served also in the Second World War.

Mr. Howland was born in Lambton in 1875; educated in Toronto, and later took up the study of Architecture in the office of Edmund Burke. Upon the completion of his course in Toronto he spent some years in the City of New York in some of the best offices there. Upon returning to Toronto, he became an associate partner with Messrs. Burke and Horwood, remaining with them until he joined with me in 1905, under the firm name of Langley and Howland.

Mr. Howland's father was one of the family of Sir William Howland, the first Lieutenant-Governor of Ontario. Oliver Howland, and Henry S. Howland, former mayors of Toronto, and Peleg Howland, were cousins of his.

Mrs. Howland is a daughter of the later Vernon Wadsworth, and their son is Commander Vernon Howland, R.C.N.

The office of Langley and Howland had been closed since about the beginning of the Second World War. At the conclusion of this, in 1945, it was decided not to open again; and Mr. Howland was fortunate, and very happy, in being associated with Messrs. Mathers and Haldenby, where he was active until his death. He died rather suddenly at his home on July 22nd and was buried in Weston on the 24th in the old Howland burying ground.

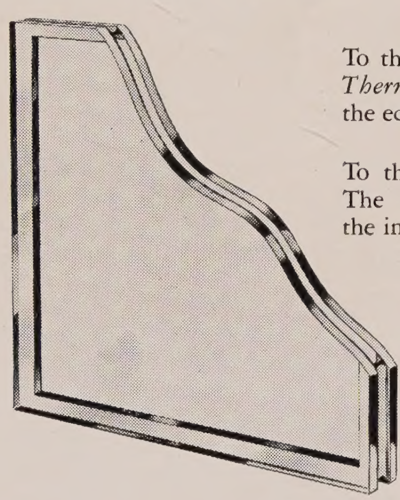
The memory of Ford Howland will remain with many as that of a sincere Christian gentleman.

*Charles E. Langley*

# Facts by Pilkington about Glass
## FOR ARCHITECTURAL STUDENTS

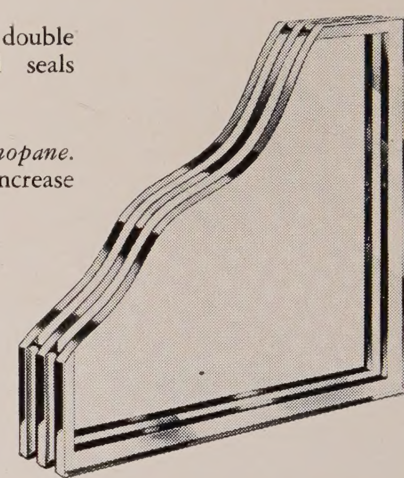
**NO. 22** ***Thermopane**** **INSULATING UNIT**

*Thermopane* is a windowpane made with built-in insulation. It is a unit of two or more panes of glass which are separated by ¼″ or ½″ of dehydrated air space and hermetically sealed around the edges at the factory with a metal-to-glass bond which is known as the Bondermetic Seal*. It is generally fabricated to ordered sizes but new Standard Sizes for double *Thermopane* have now been developed. The glass is specially washed before the Bondermetic Seal is applied and the air hermetically sealed inside is scientifically cleaned and dried.



To the left is shown a cutaway view of double *Thermopane.* The metal-to-glass bond seals the edges of the two panes of glass.

To the right is a view of triple *Thermopane.* The additional pane and air space increase the insulating value of the glass unit.



### SOME CHARACTERISTICS OF *THERMOPANE*

1. Reduces heat loss through glass
2. Reduces downdrafts at windows
3. Is a metal-to-glass welded insulating unit
4. Provides all the benefits of storm sash
5. Is suitable for all window openings
6. Increases efficiency of air-conditioning equipment
7. Reduces possibility of condensation
8. Allows uniform temperatures
9. Reduces transmission of noise
10. Is installed in a sash similarly to a single pane.

* Registered U.S. Patent Office.

(To be continued in next issue)

*Reprints of this series are available to architectural students upon request at any of our branches.*

**PILKINGTON GLASS LIMITED**

***Head Office — 27 Mercer Street, Toronto, Ontario***

***Branches:***

HALIFAX SAINT JOHN, N.B. MONTREAL KINGSTON FORT WILLIAM WINNIPEG REGINA TORONTO CALGARY HAMILTON EDMONTON ST. CATHARINES VANCOUVER

Pilkington GLASS

*For Glass and Service*